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ABSTRACT

This guide presents a student-centered program of outdoor education for students of differing exceptionalities. The role of the teacher is intended to be one of support and guidance with student involvement being essential. The manual contains activities for large groups, small groups, and individuals. Activities direct students toward learning related to their environment, and toward increased sensitivity and awareness of the aesthetics of their surroundings. Each activity includes a rationale, a terminal objective statement, an instructional objective, and suggested activities. Sufficient curriculum materials are provided for a continuous three-year program. (Author/RE)

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ECOLOGY FOR THE EXCEPTIONAL CHILD

GRADES 7-12 EMR

Developed by
Rocky River City Schools

Gordon E. Rodeen, Superintendent
Peter Metro, Project Director

INSTRUCTIONAL MATERIALS EXCHANGE

Distributed by OHIO DEPARTMENT OF EDUCATION
Division of Planning and Evaluation

SE 029 543

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FOREWORD

The Division of Planning and Evaluation of the Ohio Department of Education is pleased to announce the Instructional Materials Exchange program. This pilot venture is being conducted in cooperation with the following developer school districts:

Ashland County-West Holmes Joint Vocational School
Cincinnati Public Schools
Cleveland Public Schools
Columbus Public Schools
Parma City Schools
Rocky River City Schools
Struthers City Schools

The materials included within the series were developed under grants awarded to the above mentioned school districts by the Division of Planning and Evaluation during the past two years.

The Instructional Materials Exchange has been initiated so that more Ohio school districts can benefit from developmental project efforts by adopting practical educational products and ideas into their systems. If this pilot effort is successful, as evidenced by sufficient numbers of educators requesting materials, the dissemination effort will be expanded to include a greater variety of educational products.

The products included in this program were selected for use by Division staff members on the basis of effective field test results and the potential of the products to be used by a greater number of schools. Distribution is being made to schools without charge as long as a supply remains available.

To permit the maximum number of schools to participate, the volume of materials that may be obtained has been limited. Permission is granted by the Ohio Department of Education and the respective school districts, however, for local reproduction of the materials in any quantity desired. Reproduction beyond the intended scope of this program, such as for commercial distribution, is prohibited.

We welcome your comments regarding the materials provided, as well as your recommendations for future inclusions of products and ideas within the Instructional Materials Exchange program.

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USE OF MATERIALS

This program is designed to be a student-centered approach to learning. The role of the teacher should be one of support and guidance. Student involvement in each experience is essential, and teachers should encourage their students to be active.

The manual contains activities for large groups, small groups, and individualized study. The purpose is to provide teachers with new ways to directly involve students in meaningful learning activities related to their environment and to make them more sensitive to and aware of the beauty of their surroundings.

It was the intent of the developer district to make teaching in the out-of-doors as realistic as possible and to make each lesson complete and easy for the teacher and student to follow. Many supplementary materials will fit into this type of program, and usage should be promoted. It is necessary for each teacher to decide which activities are best suited for his/her students.

The following guidelines may be of value to teachers as they use these materials.

1. Use the worksheets the way deemed most appropriate. They can be made into transparencies, used as worksheets to be completed by students, or both.
2. Develop a meaningful vocabulary when working in each investigation.
3. Have the students develop a "Living Things Notebook" in which to keep all of their worksheets and findings.
4. Slides are easily made and can be a good resource. Students may wish to take their own slide photographs of the different topics being studied.
5. Use available outdoor facilities whenever possible. The area surrounding the school can serve as a good outdoor laboratory.
6. A good source of information for many of the activities is the garden columns of newspapers and magazines.

These investigations can be used with students of different exceptionalities. Once again, the teacher must use his/her discretion as to which investigations are appropriate for the students. Sufficient curriculum materials are provided for a continuous program over a three year period.

INVESTIGATION #1:
What Direction Is It?

RATIONALE

This investigation will be followed by activities dealing with the use of a magnetic compass. Before the students can work with a compass, they should have some knowledge of the different compass directions.

TERMINAL OBJECTIVE

Students will correctly state and locate different compass directions.

INSTRUCTIONAL OBJECTIVE #1

Students will become familiar with the different compass headings.

Suggested Activities:

1. Using direction cards (index cards with each direction written on them) as flash cards, students are to read the different compass directions.
2. Have the students place the direction cards at the correct compass locations in the classroom.
3. Use *Worksheet #1* to teach the eight different compass headings of N, NE, E, SE, S, SW, W, and NW.
4. Have each student place direction cards on their desk in the correct location for each direction in Item #3.
5. Ask the students to make up their own direction card with N, S, E, and W clearly marked.
6. Two or more students can work together on *Worksheet #2*. By giving each other directions, one student moves along the roads as directed by his partner. An example of directions might be:

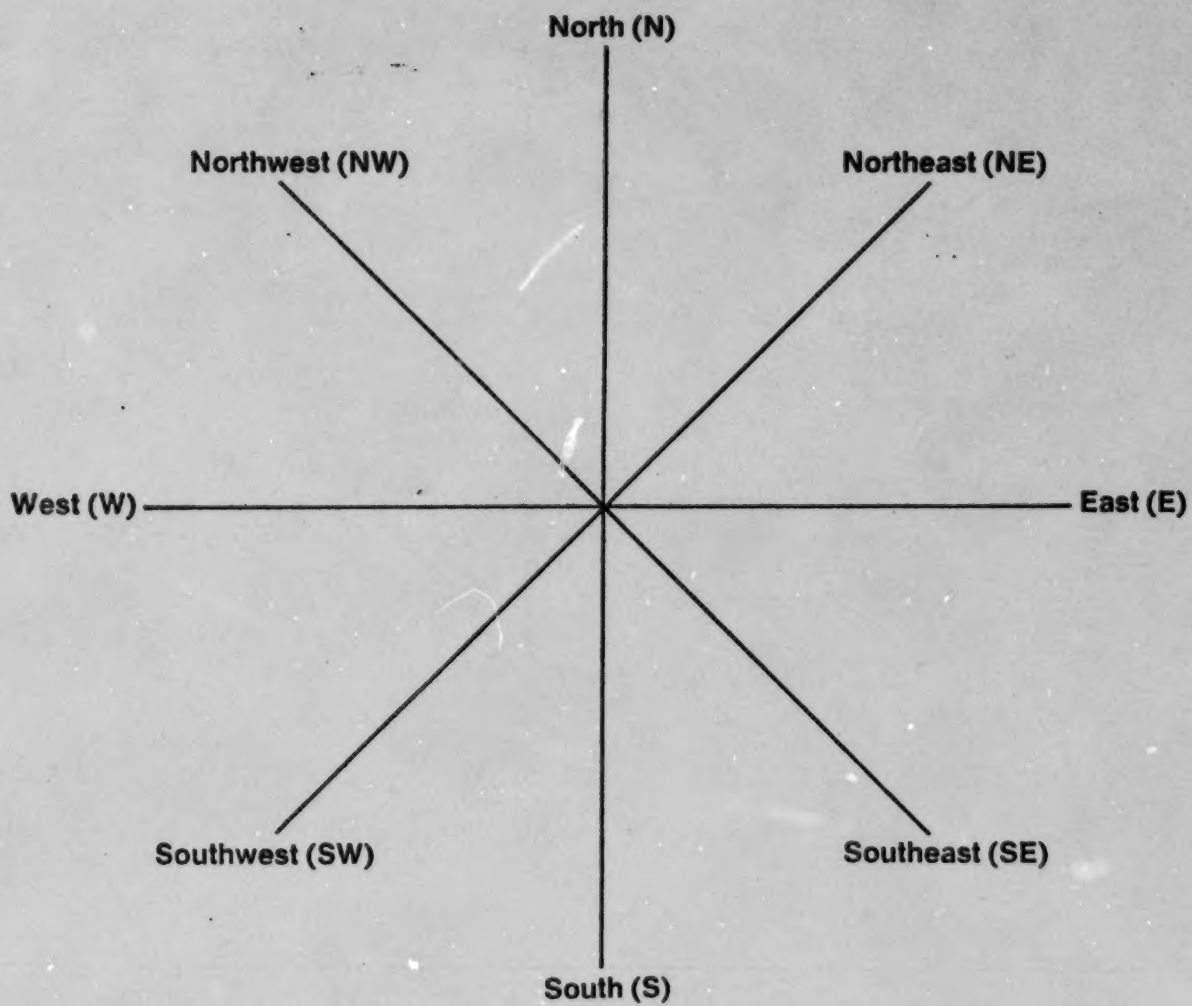
   To get out of town, you must go north to Fourth Street — Turn West. — At Second Street go south to Trees Avenue. — At Trees Avenue turn east and go to Third Street. — On Third Street turn north and follow Third Street out of town.
7. Students can practice traveling N, S, W, E, or NE, etc., from any point by using the game "Which Way You Going?" *Worksheet #3.*
8. Make a weathervane with the class or have each child make one. Check and record wind directions daily.
9. Take a walk with the students. Guide the walk by giving verbal or written compass directions.
10. Play the game "I'm Thinking of a Direction"

    I'm thinking of a direction . . .
    . . . that starts with the letter N
    . . . that is where the sun goes down
    . . . that is formed when north and west meet
    . . . that is where the classroom door is located.
11. Play "Simon Says" with the compass direction cards in place in the room. Simon says, "Jump to the north", "Step south", "Walk east", etc.
12. Make a large map of the roads in your immediate school community. Have the students label each street direction.
13. Have the students make four direction cards of their own for E, W, N, and S and tape them to their desks in the correct places. If the desks are moved, the cards must then be changed.
14. Using *Worksheet #4 Series,* have students complete each worksheet.

INVESTIGATION #1:
What Direction is It?

NAME_____

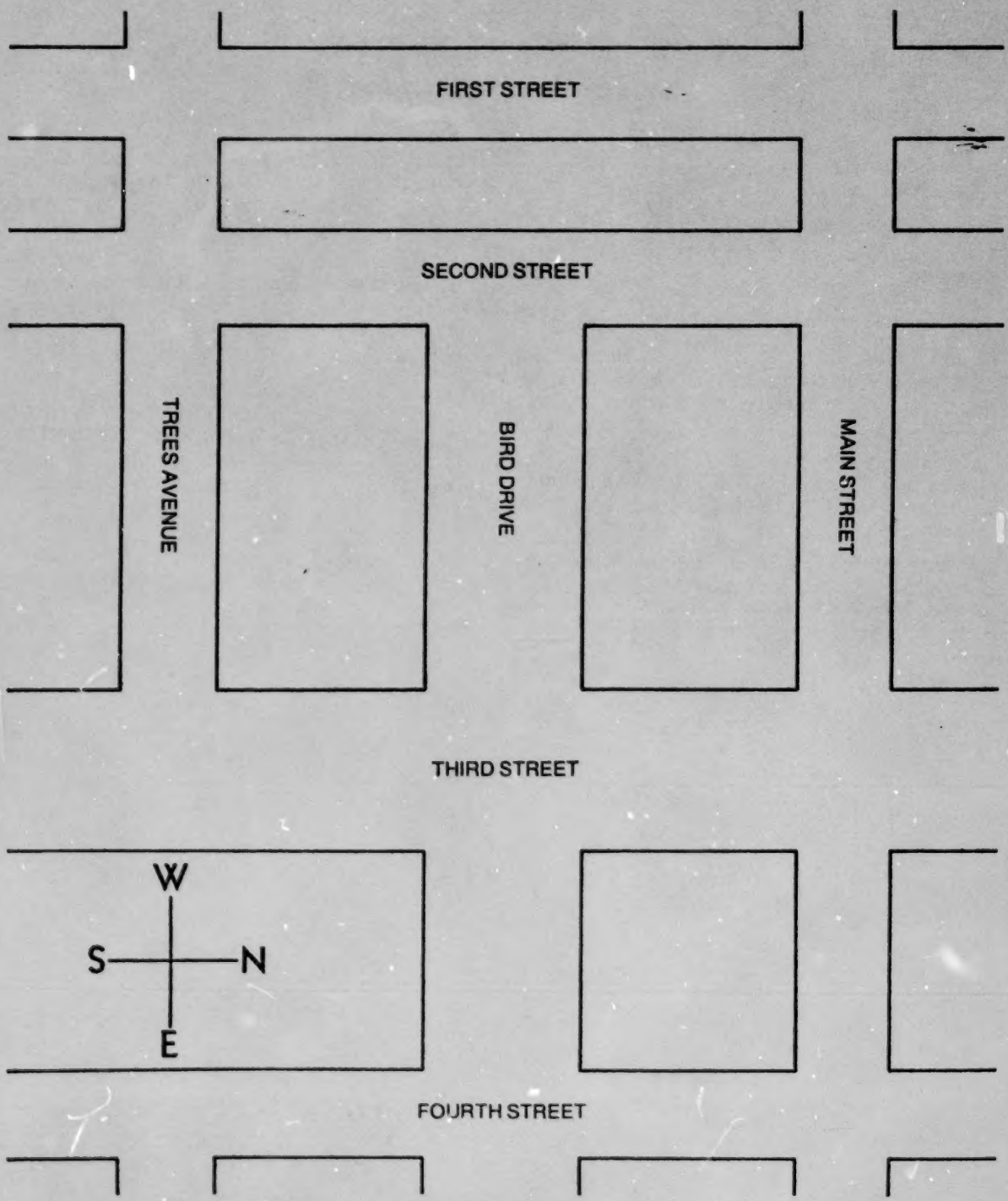
WORKSHEET #1



INVESTIGATION #1:
What Direction Is It?

NAME_____

WORKSHEET #2



INVESTIGATION #1:
What Direction Is It?

NAME_____

WORKSHEET #3

INSTRUCTIONS FOR PLAYING
"Which Way You Going?"

Number of players:

Four (4)

Materials needed:

Twelve markers, three of each color in four different colors
Directional cards
Game board

How to play:

Students pick three markers of the same color and place them at the compass direction starting points.

Someone is picked to start. He picks a direction card and moves one marker in the given direction. He cannot land in a square occupied by another player.

Only one marker is moved per card. To win the game, a player must move two of his markers in a direction other than the one at which he started. As an example, if he starts at the north side of the board, he must get two markers somewhere along the east, west, or south sides of the board. The markers do not have to land at the starting lines of the other directions to win.

If a player can only move one direction and there are two directions given on the direction cards, he must lose that move. *A player cannot move off the board.*

Direction cards:

The teacher must supply these cards. They can be easily made by placing the following type of information on index cards: One item should be placed on each card.

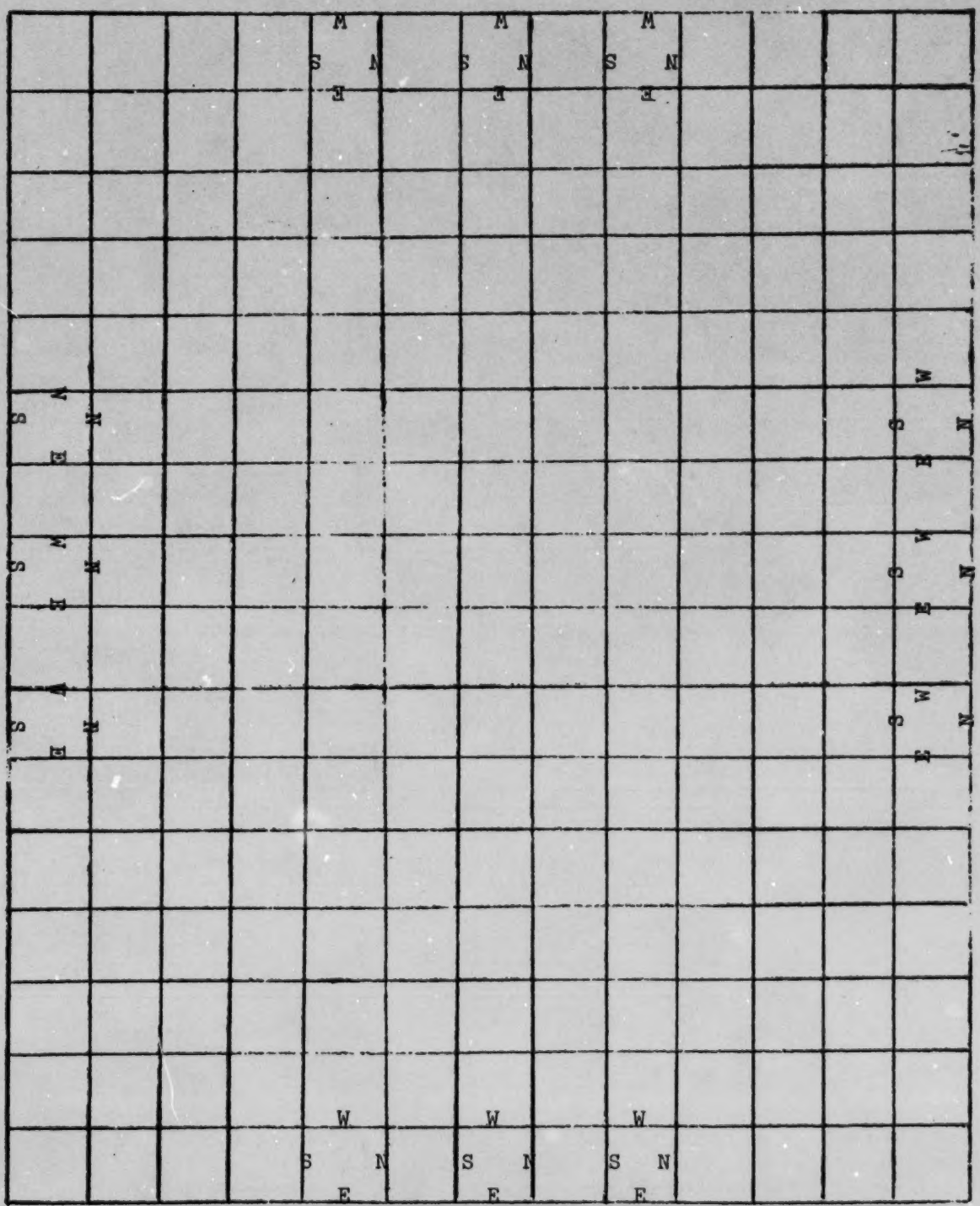
one square east
three squares north and one square south
two squares south
one square south and three squares east

10

INVESTIGATION #1:
"Which Way You Going?"

NAME _____

WORKSHEET #3



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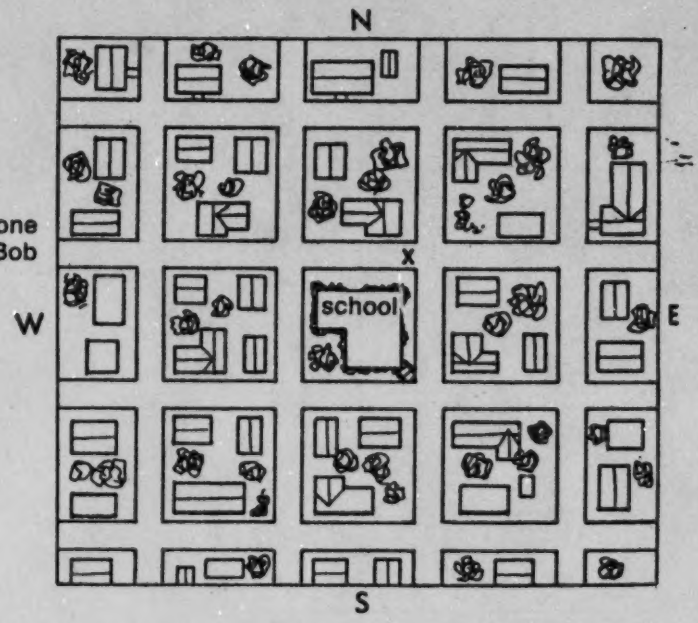
INVESTIGATION #1:
What Direction Is It?

NAME_____

WORKSHEET #4-A

Bob lives one block north of the school and one block east of it. Draw a line to show the way Bob goes home from school. Begin at the X.

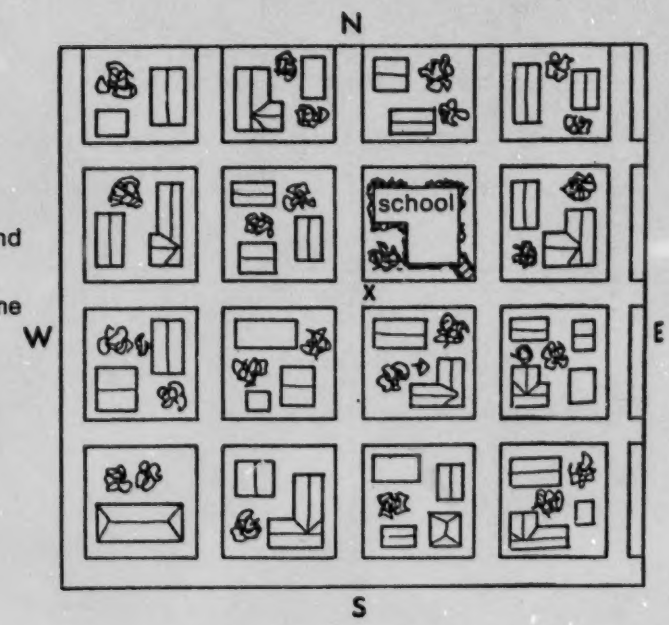
Color Bob's house red.



Jane lives two blocks south of the school and two blocks west.

Draw a line to show the way Jane goes home from school. Begin at the X.

Color Jane's house blue.



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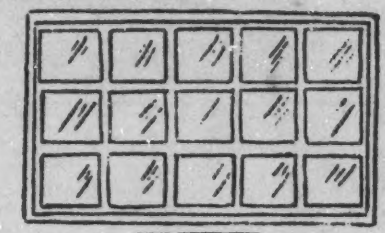
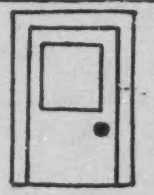
INVESTIGATION #1:
What Direction Is It?

NAME _____

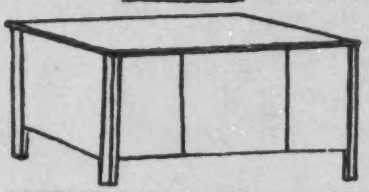
WORKSHEET #4-B



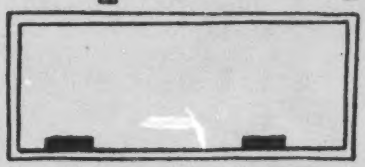
are on the _____ side



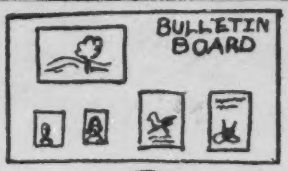
is on the _____ side



is on the _____ side

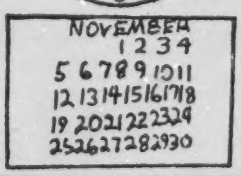


is on the _____ side



is on the _____ side

is on the _____ side



is on the _____ side

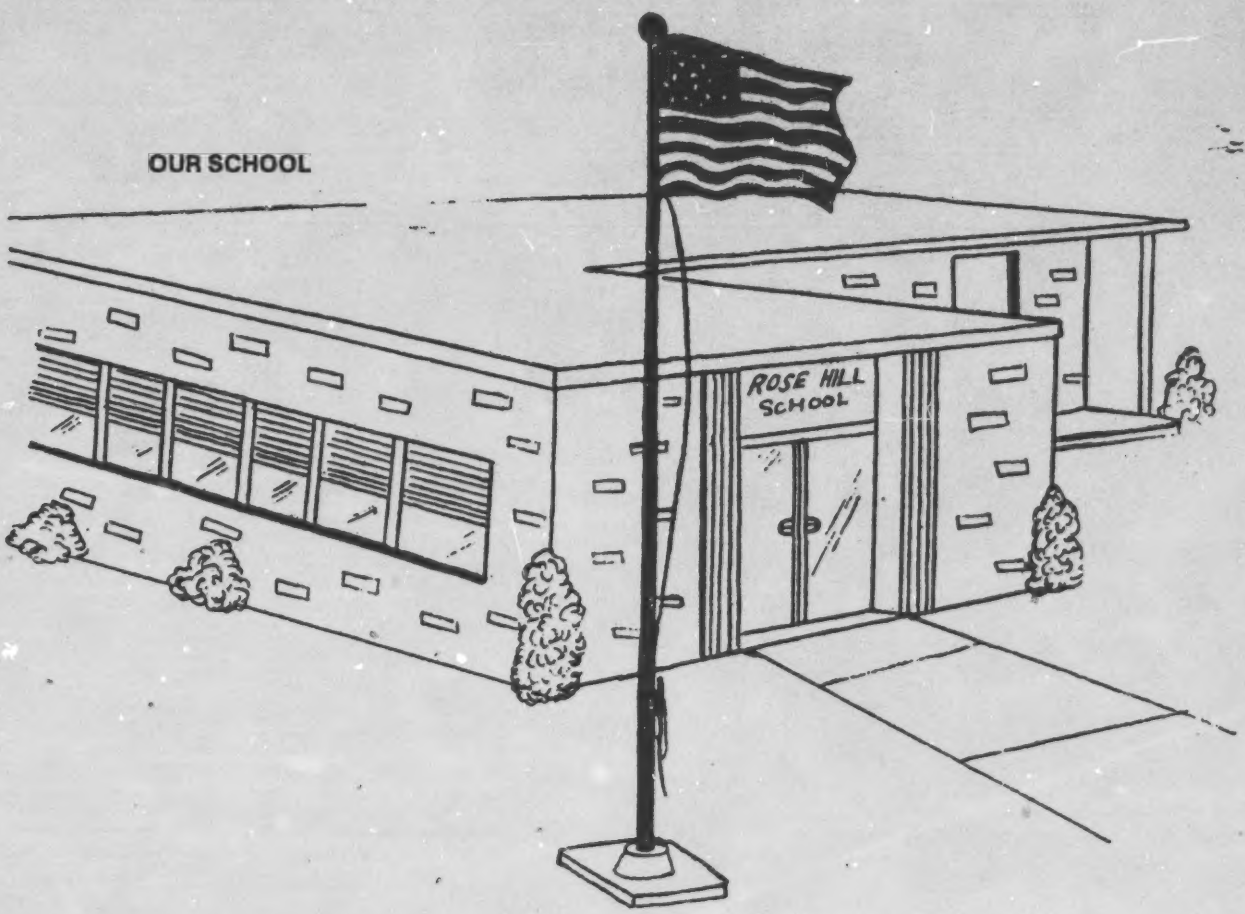
are on the _____ side

INVESTIGATION #1:
What Direction Is It?

NAME _____

WORKSHEET #4-C

OUR SCHOOL



1. Our school faces _____.
2. The back of the school is toward the _____.
3. The flag is _____ of the school.
4. Our city is _____ the school.
5. My home is _____ of the school.
6. My home faces _____.

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INVESTIGATION #2:
Using A Magnetic Compass

RATIONALE

Students may often need to know the basics of how to correctly use a magnetic compass when hiking, camping, boating, etc. In addition, during some of the following activities, the students are asked to use a magnetic compass while in the field.

A magnetic compass may be of several different designs. For this reason the instructor should follow the instructions supplied by the manufacturer when instructing students. Once the technique of using this instrument is mastered, however, almost any design of compass can be used effectively.

TERMINAL OBJECTIVE

Students will accurately use a magnetic compass.

INSTRUCTIONAL OBJECTIVE #I

Students will correctly identify the parts of and the markings on a magnetic compass.

Suggested Activities:

1. Provide each team of four students with one magnetic compass.
2. Permit the students to determine the direction of magnetic north with as little supervision as possible. Since iron in buildings can change the true reading, conduct all activities related to compass use outside the building.
3. If the compass you are using has the following parts, assist the students in learning the names of these parts and their function.
   a. Direction of Travel Arrow Indicator
   b. Compass Housing
   c. Orientation Arrow
   d. Degree Readings

INSTRUCTIONAL OBJECTIVE #II

Students will learn to care for a magnetic compass and understand how it works.

Suggested Activities:

1. Emphasize proper care of the compass by stressing:
   a. Do not drop or abuse the instrument
   b. Do not bring a magnet near or in contact with the compass.
2. Help students understand how a compass works. The colored portion of the needle points toward magnetic north. The needle of the compass is a small bar magnet. The end that points north is the south pole of this magnet.
   a. Using two bar magnets, demonstrate or have the students discover the properties of like magnetic poles repelling and unlike magnetic poles attracting.
   b. Using a thin piece of string as support, hang a bar magnet in the room so that it is free to turn and is suspended parallel to the floor. If the magnet is a reasonable distance away from any iron objects, the south pole should eventually point north.

INSTRUCTIONAL OBJECTIVE #III

Students will learn the correct way to use a magnetic compass.

Suggested Activities:

1. Teach students the correct way to hold the compass they are to use. If it is the standard instrument used by scouts, the following instructions to the students will be helpful:
   a. Hold the instrument in the palm of the hand
   b. The direction of the arrow should be perpendicular to the body.
   c. The forearm should be held against the body to steady the compass.

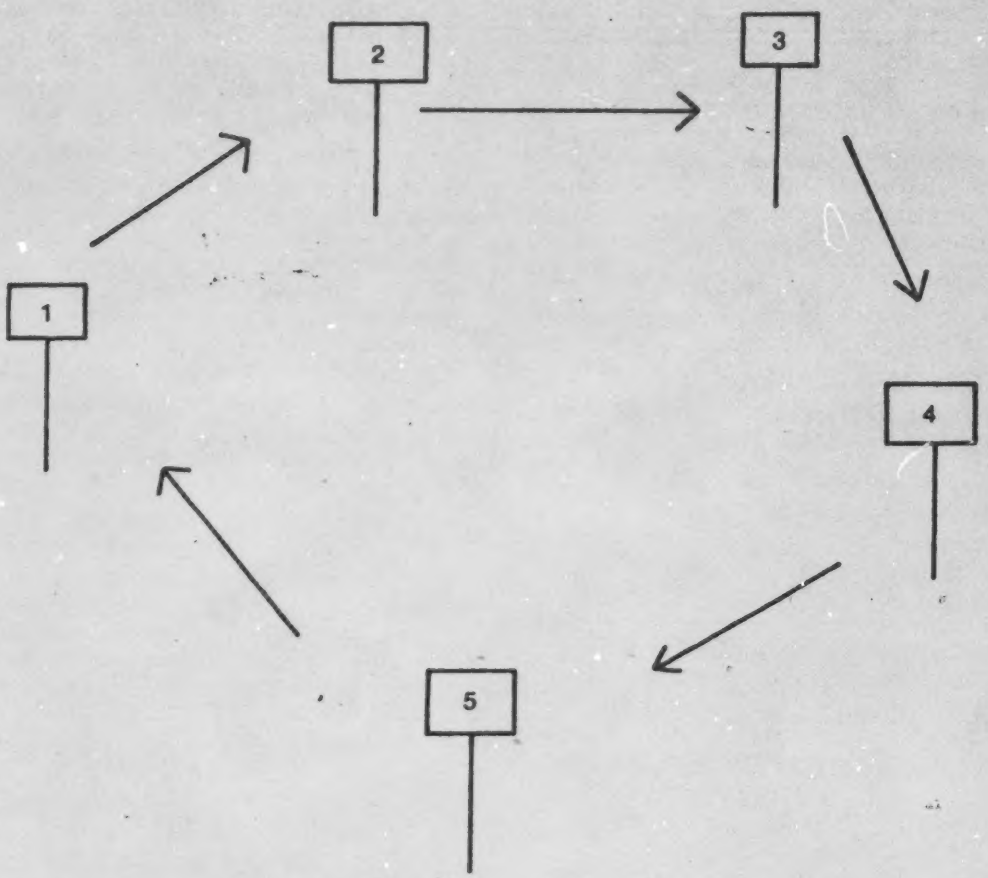
   It is important that the compass be held level so that the magnetic needle can move freely.
2. Practice using the compass. While on the playground and in an area free from objects containing iron, ask the students to use the compass to find N, E, W, S, NE, NW, SE, and SW.
3. Attempt to have students read a compass in degrees. A reading that is directly east is 90°, directly soqth is 180°, directly west is 270° and directly north is 360°.

   Ask the students to determine the compass heading of objects that can be seen in the skyline — a smoke stack, a tall building, a tree, etc. The answer should be expressed in degrees.
4. Stake out a compass trail on the schoolyard. Place clearly marked wooden stakes at given distances. Use *Worksheet #1.*
5. Take an exploratory trip to the Rocky River Outdoor Education Center. Walk along the hiking trail and ask the students to identify all the Areas of Interest they can. Each student should have a copy of the Rocky River Outdoor Education Center map. *Worksheet #2.* Plan to take a lunch and spend a full day on this activity.
6. Repeat the hike in Item #5 and ask the students to complete *Worksheet #3.*

INVESTIGATION #2:
Using A Magnetic Compass

NAME_____

WORKSHEET #1



Instructions:

Your teacher has prepared a compass trail for you. Start at Stake No. 1 and take the compass reading and measure the distance to Stake No. 2. Repeat the measurements from Stake No. 2 to Stake No. 3. Continue the measurements until you are back to Stake No. 1. *Record all of your information on the following chart.* Use a tape measure to determine distance.

	Degree Reading	Distance in Feet
From Stake No. 1 to Stake No. 2		
From Stake No. 2 to Stake No. 3		
From Stake No. 3 to Stake No. 4		
From Stake No. 4 to Stake No. 5		
From Stake No. 5 to Stake No. 1		

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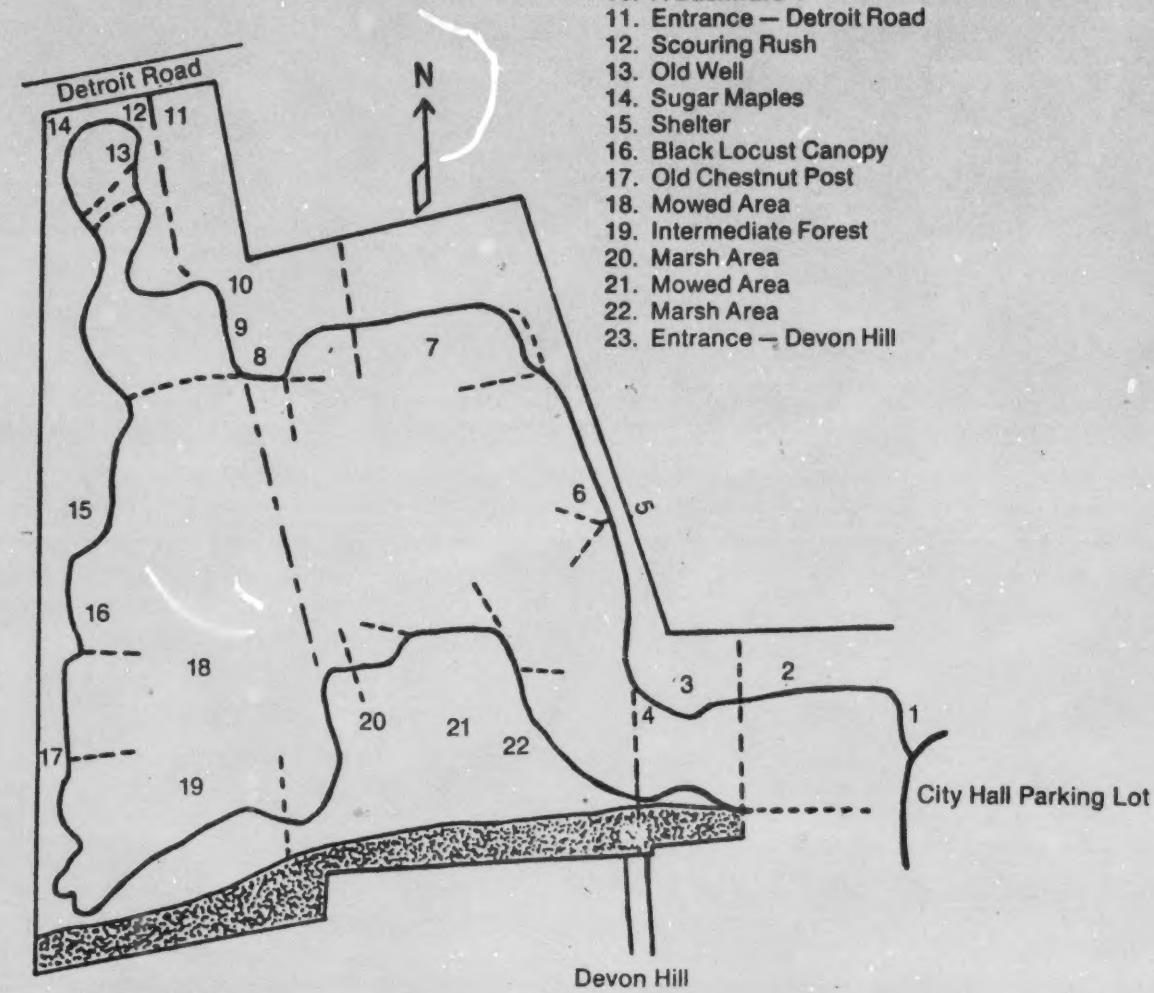
INVESTIGATION #2:
Using A Magnetic Compass

NAME_____

WORKSHEET #2

ROCKY RIVER CITY SCHOOL DISTRICT
OUTDOOR EDUCATION CENTER
Hiking Trail Map

Hiking Trail
Sewer Easement
Crossing Trails
Road



AREAS OF INTEREST

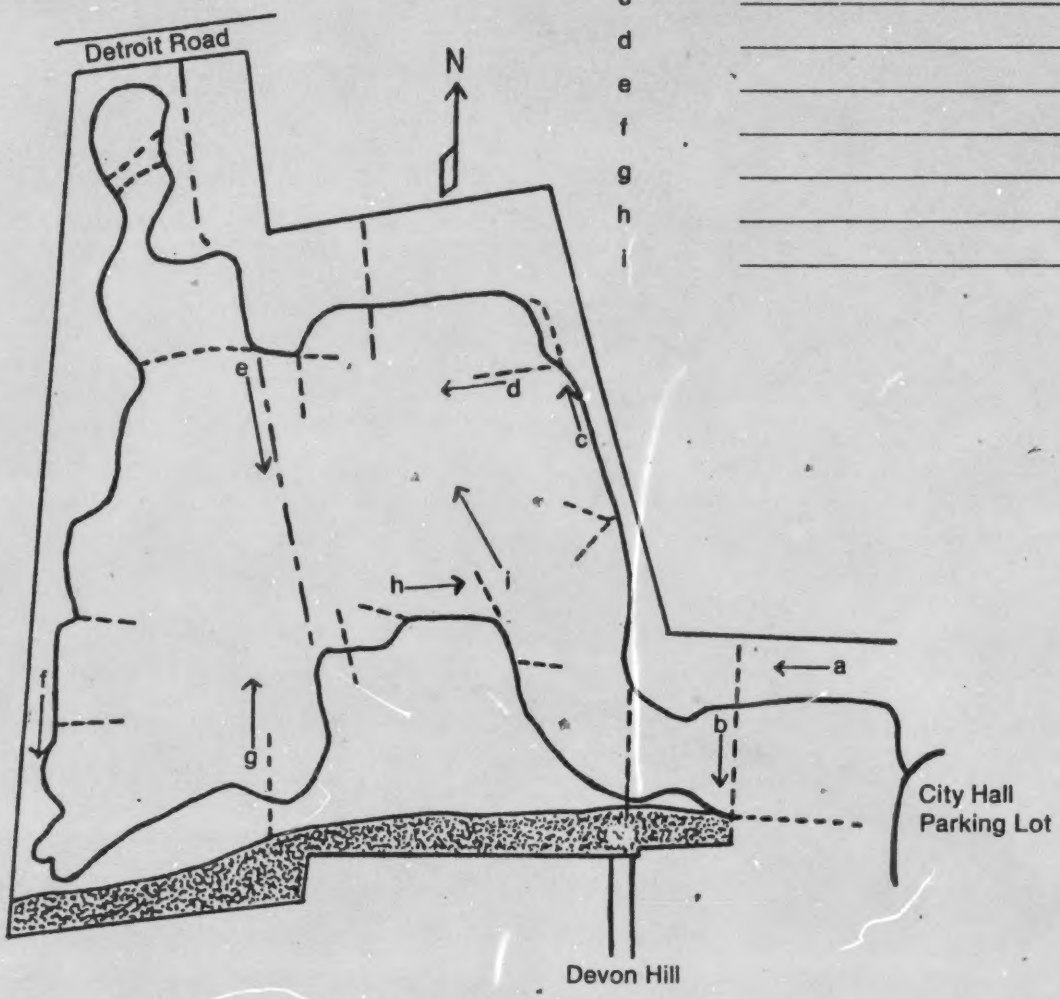
1. Entrance — City Hall
2. Mixed Forest
3. Grape Vine Canopy
4. Intermediate Forest
5. Condominium Construction
6. Cultivated Area In Early Stages of Recovery
7. Intermediate Forest
8. Area Where Rest Room Was Burned By Vandals
9. Large Poison Ivy Vines Cross Section Shows Growth Rings
10. A Backward 4
11. Entrance — Detroit Road
12. Scouring Rush
13. Old Well
14. Sugar Maples
15. Shelter
16. Black Locust Canopy
17. Old Chestnut Post
18. Mowed Area
19. Intermediate Forest
20. Marsh Area
21. Mowed Area
22. Marsh Area
23. Entrance — Devon Hill

INVESTIGATION #2:
Using A Magnetic Compass

NAME_____

WORKSHEET #3

ROCKY RIVER CITY SCHOOL DISTRICT
OUTDOOR EDUCATION CENTER
Hiking Trail Map



What is the compass reading, in degrees or general direction, for points "a" through "i" marked on the map?

Take the reading in the direction the arrow is pointing

Point	Direction
a	_____
b	_____
c	_____
d	_____
e	_____
f	_____
g	_____
h	_____
i	_____

18

INVESTIGATION #3:
Poisonous Plants

RATIONALE

Students should learn to identify poisonous plants so that they will respect and avoid them. If a student is exposed to poisonous plants, he should know how to care for and treat the exposed regions of his body.

TERMINAL OBJECTIVE

When shown five different types of common plants, the student will distinguish the poisonous plants from others.

BACKGROUND INFORMATION

Poison Ivy The poison ivy plant is a low shrub if it is growing in an open area. It can also be a vine climbing trunks of trees, stone walls, fence posts, etc. The shiny green leaves are made up of three leaflets which turn red in autumn. Early in the spring, tiny white flowers are attached to the main stem. These develop into clusters of poisonous white or gray berries.

If the juices from poison ivy get on your skin, it will cause itching, burning and blisters. These symptoms usually occur within three to five days after contact. The area of skin that has been exposed to poison ivy should be washed several times with strong soap such as Fels-Naptha. Rubbing alcohol can be applied after washing. *"Wash or scratch later!"* is a good motto for students to follow.

In addition to direct contact with the plant, the irritant may be spread by dogs, cats, or other animals; by contaminated clothing, garden or yard tools, or sports equipment such as golf clubs, or fishing rods; or by accidental eating of the fruits. The juice of the plant may also be carried in smoke or dust particles. It is therefore dangerous to be in the smoke from the burning plant. The pollen is blown by wind, and it is possible for an extremely susceptible person to contact the poison merely by being near the plant when the pollen is in the air.

Over sixty different kinds of birds eat the poison ivy berries. From the point of being an excellent food source for birds, the plant is very helpful. However, the birds eat the berries and spread the seeds over the countryside.

Pokeweed Pokeweed is a large shrublike bush which can grow to eight feet tall. The stems are green, red or purple. The flowers are in clusters and are white, with round purple and black berries. The pokeberry is found throughout the eastern United States and southern Canada. It is usually found in open fields, along fences, and roadsides. The poisonous part of the plant is in the roots, less in the leaves and stems, and least in the fruit. Eating of the poisonous parts causes a burning sensation of the mouth, severe stomach cramps and pain, nausea with persistent vomiting, diarrhea, slowed and difficult breathing, weakness, spasms, severe convulsions and death.

Deadly Nightshade The true deadly nightshade is a shrub about five feet tall with dull purple flowers and purple to black berries. The poisonous parts are found throughout the plant (berries, leaves, roots, and flowers), but the black berries have been the part usually eaten. Symptoms of deadly nightshade poisoning are: fever, rapid pulse, dilation of pupils, and flushed skin. It can be fatal with as few as three berries being sufficient to kill a child.

Although the true deadly nightshade grows mostly in the orient, it is now sold in the United States as an Ornamental plant. The common nightshade, which is a vine, is very plentiful in Ohio. It is not as poisonous as the deadly nightshade, but the fruit can cause illness if eaten.

All plants in the nightshade family contain the drug *belladonna*. For this reason, this family of plants is commonly referred to as belladonna.

Other Poisonous Plants There are other plants that contain poisonous parts. Some of these plants and their poisonous parts are listed below. You should bring them to the attention of your students.

Plant	Poisonous Parts
lily of the valley	the entire plant
jack-in-the-pulpit	leaves and roots
rhubarb	leaves
wisteria	seeds and pod
mistletoe	berries
rhododendron	leaves and flowers
elderberry	stem and leaves
narcissus	bulbs, leaves and flowers
Mayapple	roots
holly	berries
wild mushrooms	the entire plant
azalea	leaves and flowers
hyacinth	bulbs, flowers, and leaves
poinsettia	berries
castor bean	seed

First-Aid What should you do in case of internal poisoning? Call your physician immediately. Be prepared to give him this information: name of plant if known, how much and which parts of the plant were eaten, how long ago it was eaten, age of the individual, symptoms observed and a good description of the plant if the name is unknown. Save a specimen for later identification.

If a physician cannot be contacted, have the individual drink a glass or two of water and then (if he is not unconscious or convulsive) try to induce vomiting by gagging the back of the throat with a finger or blunt instrument (spoons, etc.) or by giving warm salt water (no more than one teaspoonful salt to a glass of water for a child; excess salt for this purpose can produce salt poisoning and even death), mustard water, or soapy water. Take the person to the nearest hospital emergency room or clinic. Be sure to take the plant along for identification.

The Poison Control Center in your area may be helpful if your physician is not available. These centers can provide information on proper therapy and may be able to aid in the identification of the plant. The Poison Control Center's telephone number is 231-4455.

PRETEST

Students will point to and verbally identify the three poisonous plants illustrated on *Worksheet #1.*

POST TEST

At the conclusion of the unit, the student will match the picture of the leaves with the appropriate descriptor — *Worksheet #2.*

INSTRUCTIONAL OBJECTIVE #1

Students will be able to identify three poisonous plants.

Suggested Activities:

1. Using an overhead projector with pictures of poisonous plants, observe and discuss *Worksheets #3, 4, and 5.*
2. Utilize flash cards with pictures of poisonous and non-poisonous plants; have students identify which plants are poisonous. *Worksheets #6-11.*
3. Ask students to draw or trace three poisonous plants which are harmful to man. These drawings should be included in the student's notebook on living things.
4. Ask students to label pictures of six plants on *Worksheet #12* using a "smily" face to identify non-poisonous plants and a skull and crossbones to identify poisonous plants.
5. On *Worksheet #13,* have students outline the poisonous plants with a pencil arid label each.
6. From the following list of plants, the students will identify the edible and non-edible fruits:
    - •Poison ivy
    - •Strawberry
    - •Raspberry
    - •Pokeberry
    - •Blueberry

INSTRUCTIONAL OBJECTIVE #II

Students will be able to state the proper precautions and treatment of the effects of poisonous plants.

Suggested Activities:

1. Using *Worksheet #14,* discuss the treatment of a rash caused by poison ivy.
2. Ask students to write a paragraph telling how to prevent catching poison ivy.
3. Ask students to describe a case of poison ivy by choosing one of the following three descriptions of skin irritaitions:
    - •black and blue marks
    - •scraped skin with bleeding
    - •watery bumps that itch.
4. Ask students to discuss what to do if deadly nightshade or pokeberries are eaten.

INSTRUCTIONAL OBJECTIVE #III

Students will discover how poisonous plants grow.

Suggested Activities:

1. Ask students to discuss how poisonous plants are spread from locality to locality.
2. Have students discuss how they can control poisonous plants near their home.
3. Hike through a natural area and have students describe the locations where poisonous plants grow and why they are growing there.
4. Have the students construct a mural of plants in a natural setting; include plants that are poisonous.

Leaves of three
Quickly flee
Berries white
Poisonous sight!

20

INVESTIGATION #3:
Poisonous Plants

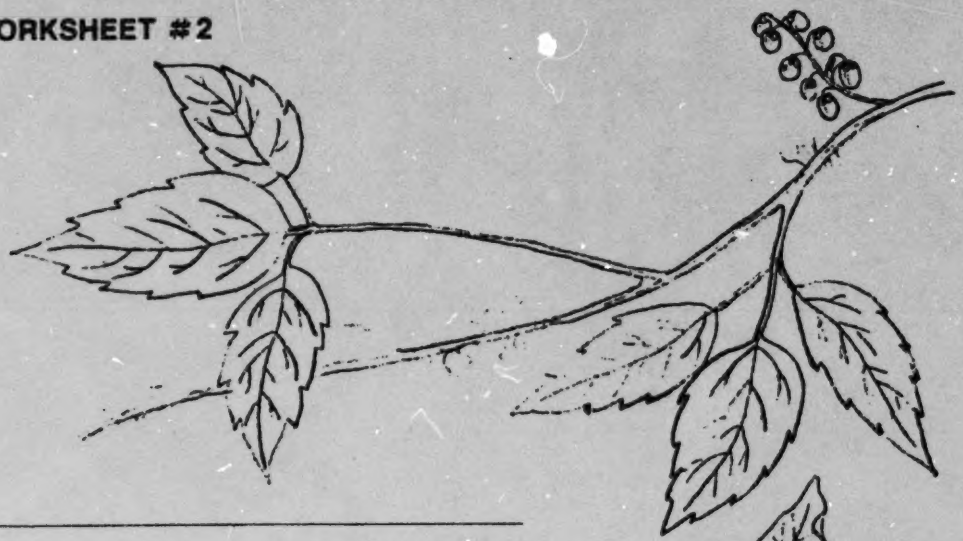
NAME_____

WORKSHEET #1

INVESTIGATION #3
Poisonous Plants

NAME_____

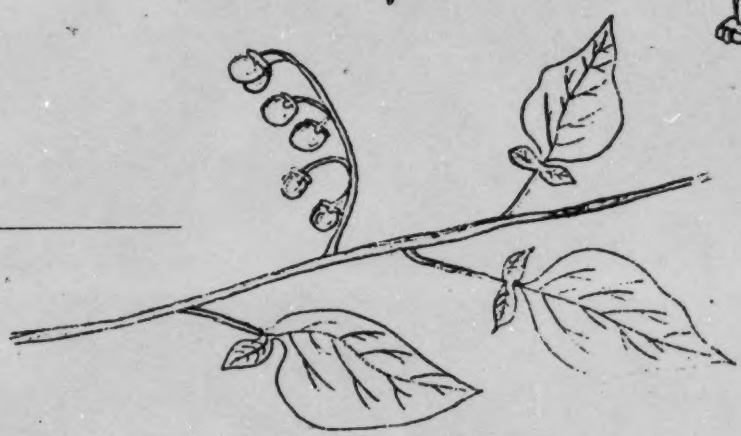
WORKSHEET #2



A. Pokeberry
B. Poison Ivy
C. Deadly Nightshade

1. _____

2. _____



3. _____

22

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #3

Poison Ivy

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #4

Pokeberry

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #5

Deadly Nightshade

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #6

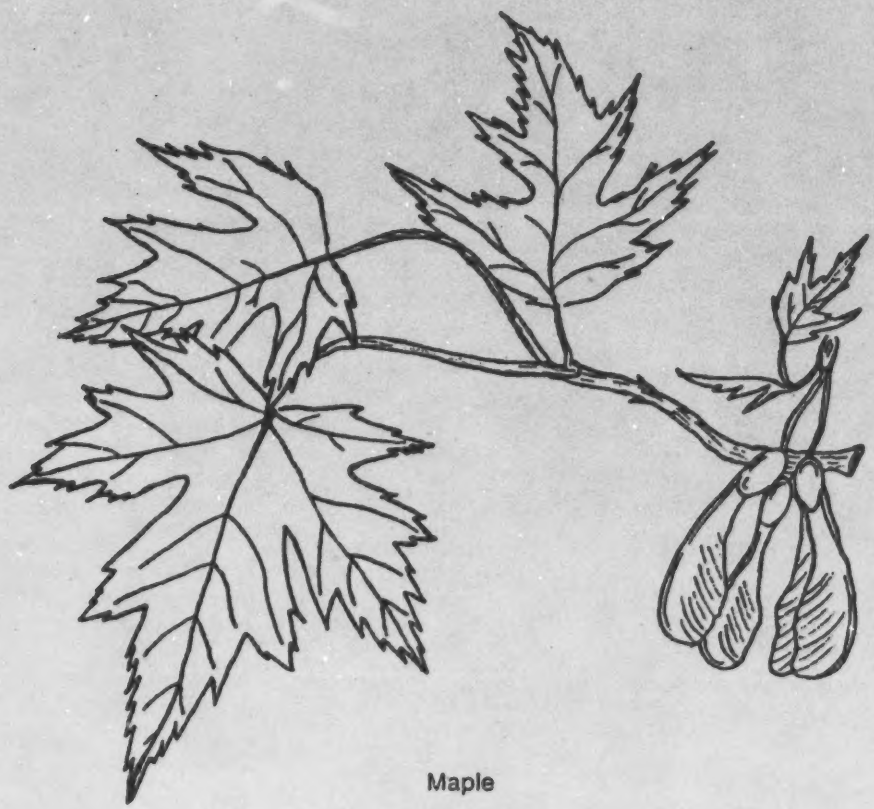
Poison Ivy

26

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #7



Maple

27

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #8

Violets 28

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #9

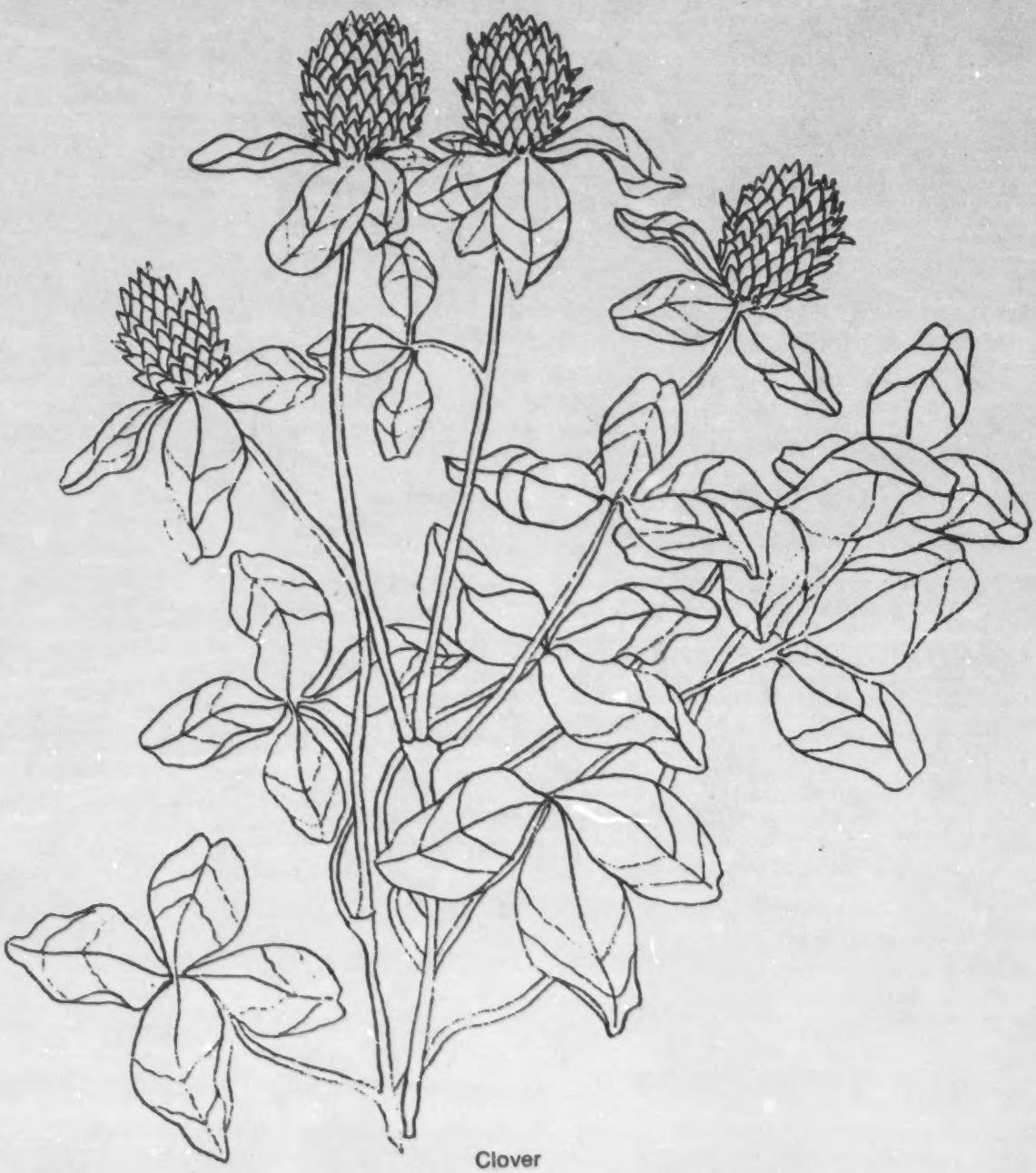
Pokeberry

29

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #10



Clover

30

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #11

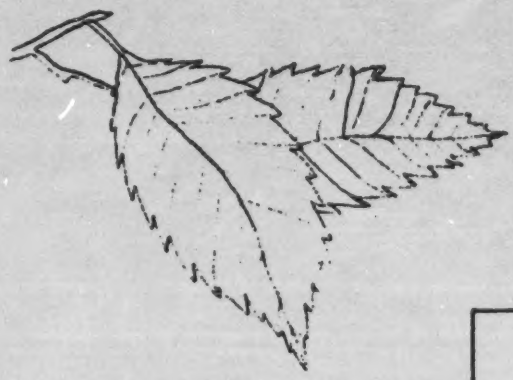
Deadly Nightshade

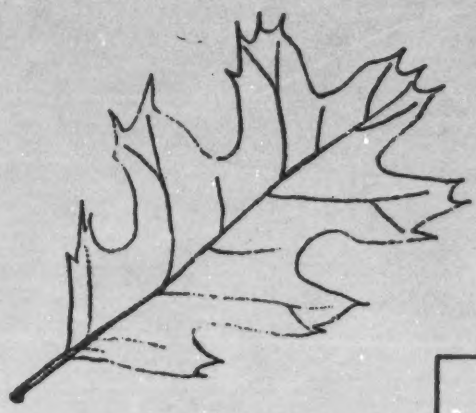
INVESTIGATION #3
Poisonous Plants

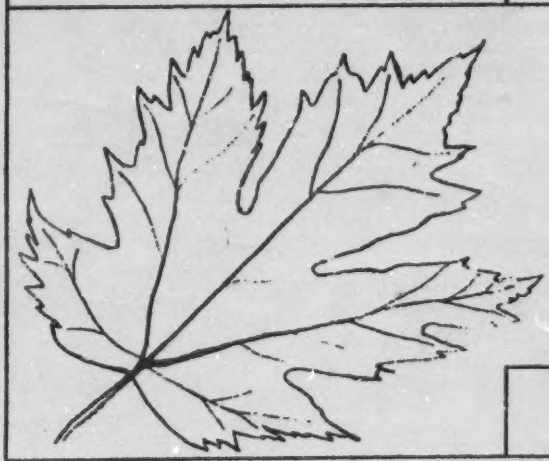
NAME_____

WORKSHEET #12

Poisonous Non-poisonous

A. 

B. 

C. 

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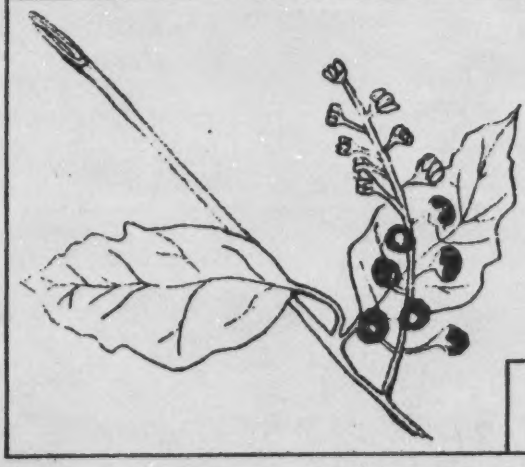
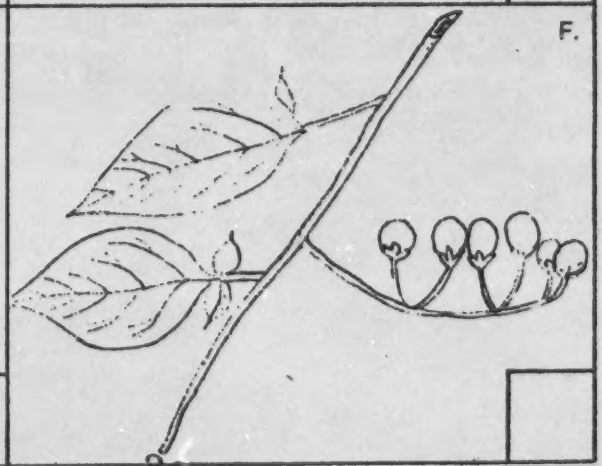
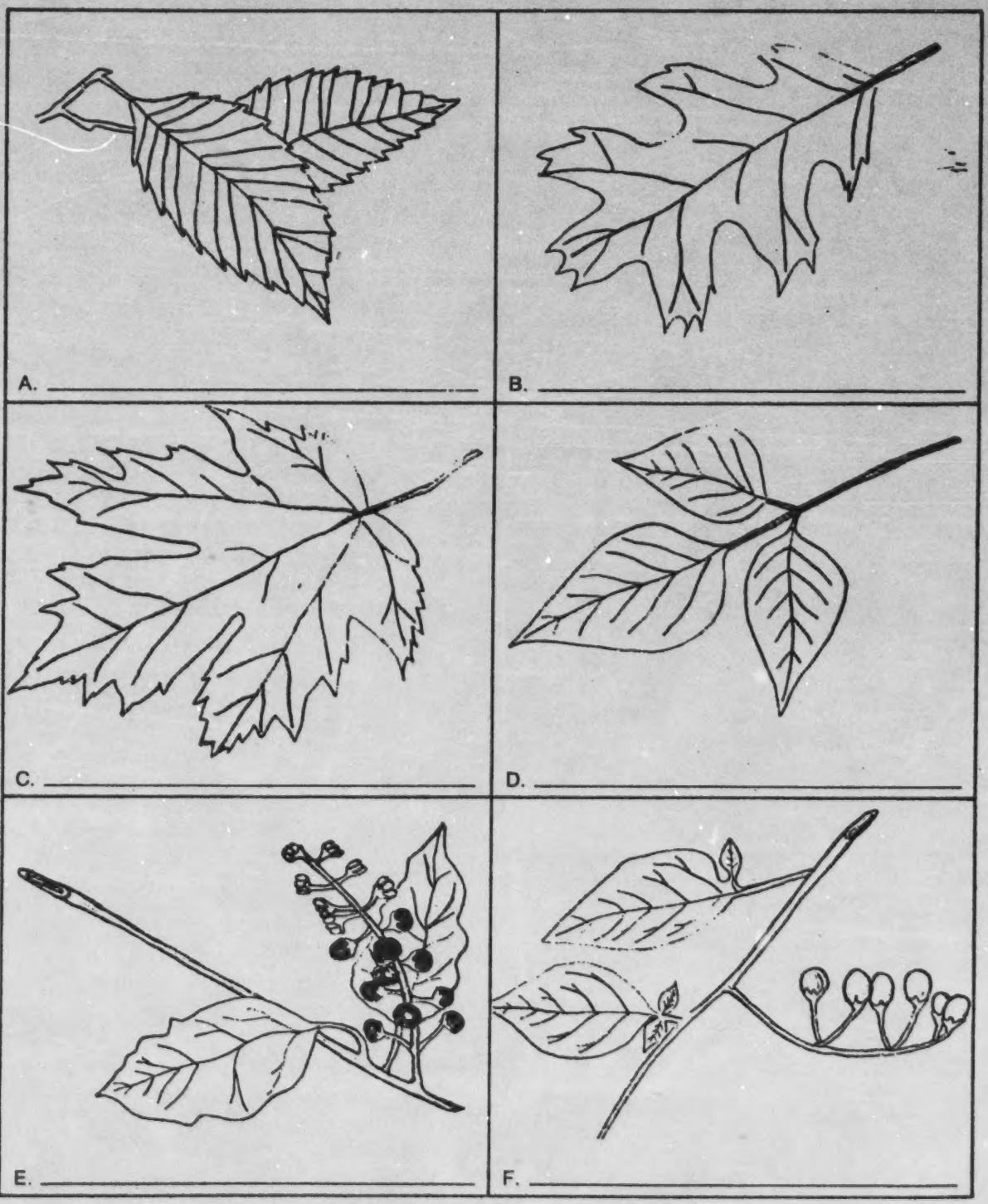
E. 

F. 

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #13



A. _____

B. _____

C. _____

D. _____

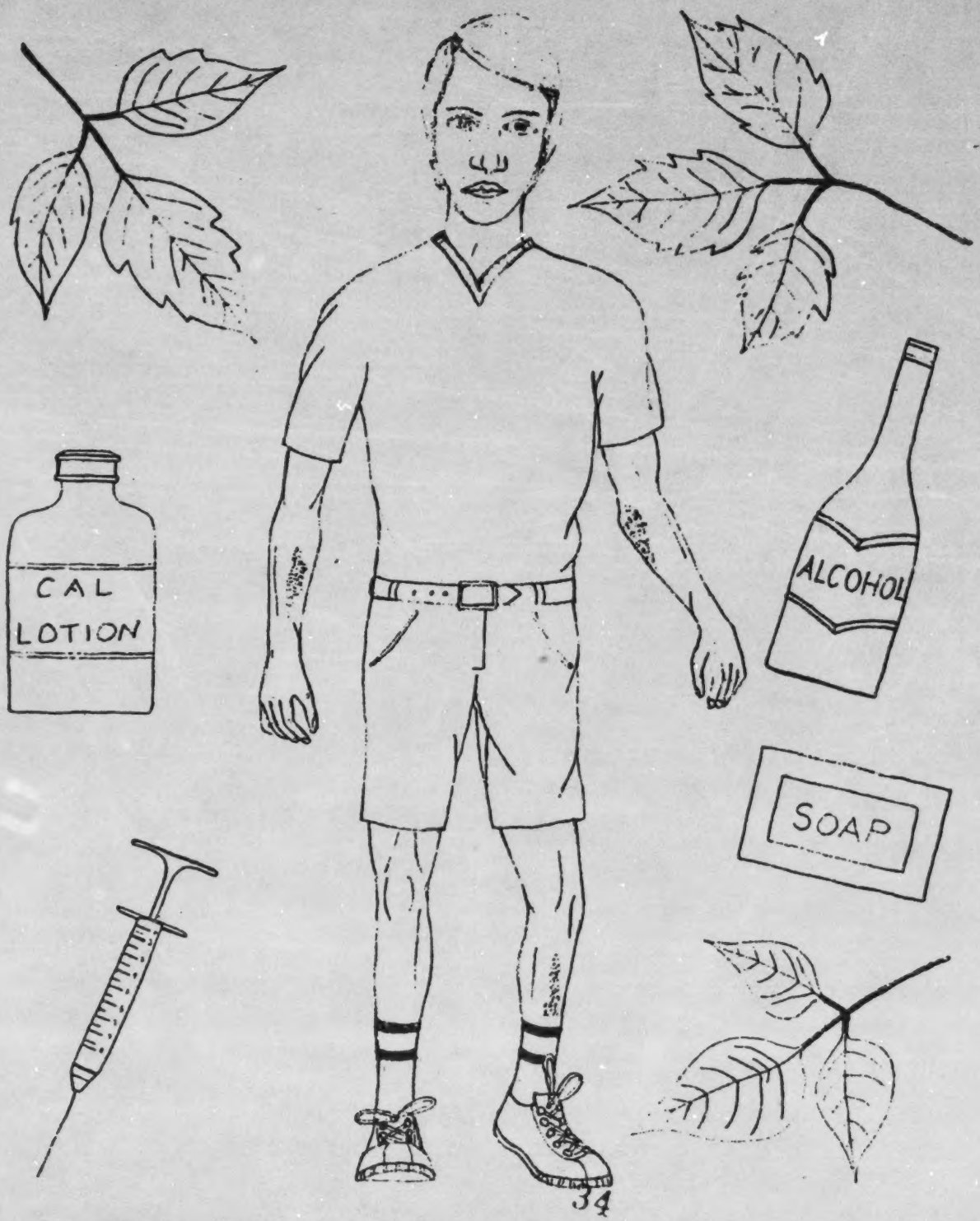
E. _____

F. _____

INVESTIGATION #3
Poisonous Plants

NAME_____

WORKSHEET #14



INVESTIGATION #4:
Seeds

RATIONALE

For youngsters to understand the reproduction of plants, the initial study of most plant growth cycles must begin with the understanding of seeds — their structure and their purpose.

TERMINAL OBJECTIVE

Students will be able to recognize common seeds and identify similarities and differences in structure and their purposes.

BACKGROUND INFORMATION

Man helps spread seeds of plants throughout the world. Seeds that produce plants prized for beauty or food and other valuable products are distributed internationally and propogated in areas where conditions permit growth. In addition, man and other animals sometimes transport seeds without knowing it. In this way, many unwanted plants have been spread from country to country.

Some kinds of seeds are equipped with hooklike devices and become fastened to clothing and fur. Later, the seeds are picked off or dropped giving them a new place in which to establish a new plant. Some are transported in the mud on shoes or on the feet or hoofs of animals. Some have feathery tufts and are blown long distances by the wind. Milkweed seeds are examples of these. Seeds that can float are often carried by rivers and ocean currents to points far from the plants that produced them. Coconuts have spread through warm regions around the world in this manner.

PRE AND POST TEST

Have each student verbally identify the following seeds on *Worksheet #1.*

A. Pumpkin
B. Marigold
C. Sunflower
D. Beet
E. Corn
F. Watermelon

INSTRUCTIONAL OBJECTIVE #1

Given a prepared collection of seeds, students will recognize and identify the seeds we use as food and where they are produced in the plant.

Suggested Activities:

1. Give each group of students a prepared collection of seeds consisting of: peas, corn, oats, lima beans, navy beans, beets, sunflower, and pumpkin.
   a. Ask students to identify the seeds that man uses as food.
   b. Assist the students in learning the names of each type of seed in the collection.
   c. Discuss how each of these seeds can be used by humans.
2. Have students draw a picture of the plants the seeds in Activity #1 produce.
3. Provide an opportunity for each student to plant three seeds of one type from the list suggested in Activity #1. If possible, have each student plant a different kind of seed.
4. Make a seed collection from plants around your home or school. Include vegetables, field crops, shrubs, trees, fruits, weeds, etc. You may also want to include seeds from fruits or vegetables that you buy in the store. Most seeds can be mounted on cardboard or stiff paper with glue or scotch tape. Place all vegetable seeds on one sheet, all wildflower seeds on another sheet, etc. Be sure to name the kinds of seeds you collect.
5. Make a collection of seeds eaten by wild birds and other wild animals.
6. Ask the students to collect samples of seeds they have at home and use as food.
7. Make a list of seeds that students have thrown into the trash in the past week. These will probably be seeds from apples, peaches, plums, cherries, oranges, squash, pumpkin, avocado, etc. Have students bring such seeds to class and mount them as "Seeds I Throw Away".
8. Toast pumpkins seeds. Remove the stringy fiber from the unwashed pumpkin or squash seeds. Spread in a shallow pan. Add enough cooking oil to coat all the seeds and salt to taste. Toast in a 300° oven — turning often — for 15 to 20 minutes or until brown. Cool and munch.
9. Pop some popcorn as an example of some seeds we eat that are changed by the addition of heat. What makes popcorn pop? Students should understand that moisture within the seed turns to steam: this expansion causes popping of corn.
10. Using common fruits or vegetables, dissect the seed pod or fruit to discover where seeds are produced.
11. Using *Worksheet #1,* have students identify each seed.
12. Using *Worksheet #1,* have the students match the real seed with the correct drawing and identify each.
13. Using *Worksheet #2,* have students draw a ring around the three seeds that we use as food.

35

14. Using *Worksheet #3*, have students find the location of the seeds in each plant.
15. Ask the students to answer the questions on *Worksheet #4.*

INSTRUCTIONAL OBJECTIVE #II

The students will recognize and identify the basic structure of common seeds.

Suggested Activities:

1. Soak lima bean seeds in water for a 24 hour period. Compare the soaked seed with a dry seed. Note the size difference and infer the reason for this difference.
2. Remove the seed coat from a soaked bean and attempt to identify the young plant and the stored food. Have each student do this, if possible.
3. Reinforce Item #2 by using transparencies of the lima bean seed parts. *Use Worksheet #5 series.*
4. Repeat Item #1 using other seeds. Compare the difference.
5. Distribute raw peanuts to the class. Have each child open the fruit shell and extract the two seeds. Each seed splits into two halves, ask the students to find the embryo. The papery covering is called the *nucellus* and is a modified seed coat. Point out to the students that the peanut is not a nut, but belongs to the same family as peas and beans.

INSTRUCTIONAL OBJECTIVE #III

The student will identify the conditions necessary for seed germination and plant growth.

Suggested Activities:

1. Provide an opportunity for the students to construct wet towel gardens as outlined on *Worksheet #6.*
   a) Inspect the germinating seeds daily and note changes.
   b) Using hand lenses, closely observe the roots of the germinating seeds for root hairs and discuss their purpose.
   c) Look for evidence of leaf formation in the germinating seeds.
   d) Compare the germination of a corn seed to that of a bean.
   e) Using *Worksheet #7 and #8,* have students compare their plants to the correct drawing.
2. Provide an opportunity for students to experiment with the effects temperature has on seed germination. Attempt to germinate seeds in a refrigerator and at the same time germinate seeds in a darkened space in the classroom. Make sure that all conditions are the same except for temperature. Compare the results.
3. Have the students design and conduct an experiment that will indicate the effect of light on seed germination. Remember to keep all conditions constant with the exception of the amount of moisture.
4. Have the students design and conduct an experiment that will indicate the effect of light on seed germination.

INSTRUCTIONAL OBJECTIVE #IV

Students will be able to state if a seed is dispersed by wind, water or animals.

Suggested Activities:

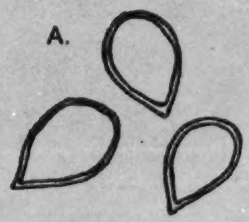
1. Take a hike through an outdoor area such as the Rocky River Outdoor Education Center and collect one sample of each seed that can be found.
2. *Worksheet #9 and #10* can be used to guide a discussion on how seeds travel.
3. Upon returning to the classroom, separate the collected seeds into three sets; those spread by wind, those spread by water and those spread by animals.
4. Make a chart to show how various seeds are dispersed. Glue the seeds to the chart under each of the three categories.
5. Have the students describe any special feature of the seeds which help in dispersion.
6. Put some seed in a bird feeder and see which birds like each particular kind of seed.

INVESTIGATION #4:
Seeds

NAME_____

WORKSHEET #1

A.



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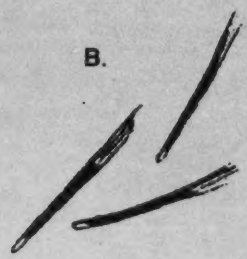
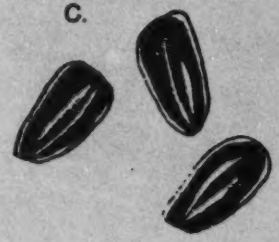


C.



D.

E.

F.

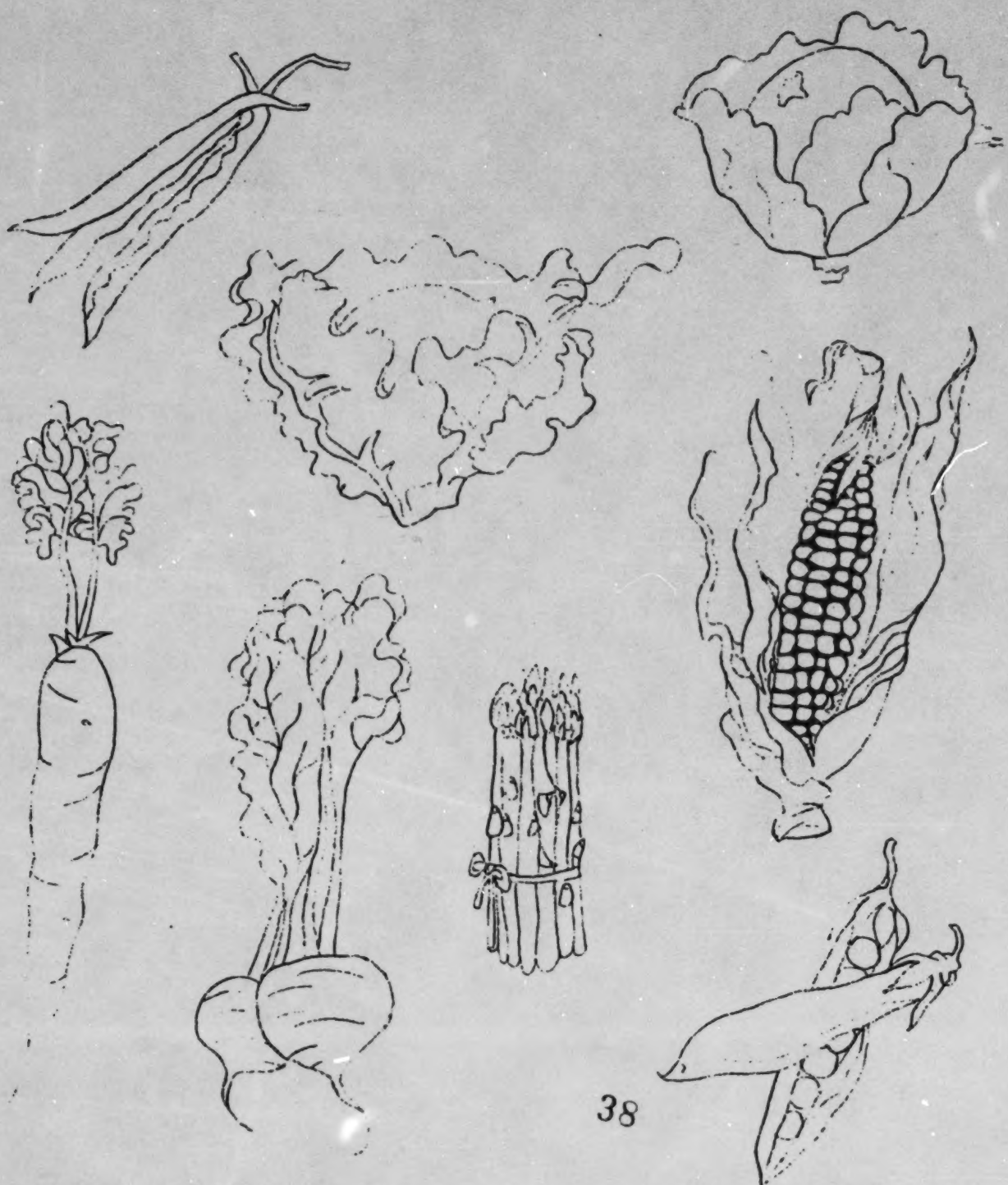
G.

37

INVESTIGATION #4:
Seeds

NAME_____

WORKSHEET #2

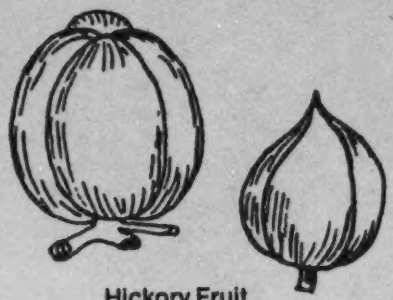


38

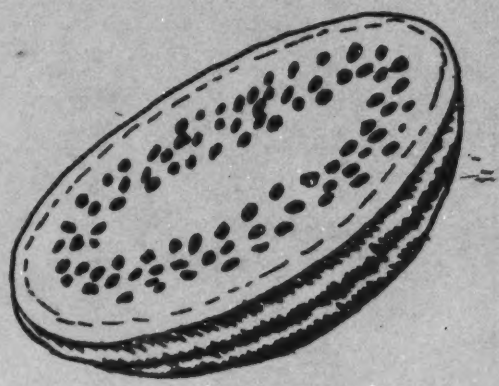
INVESTIGATION #4:
Seeds

NAME _____

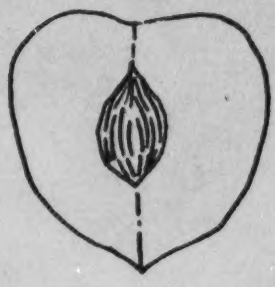
WORKSHEET #3



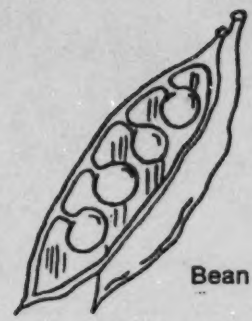
Hickory Fruit



Watermelon

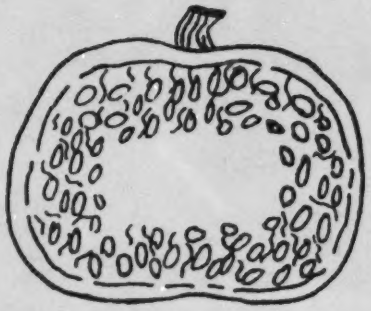


Peach

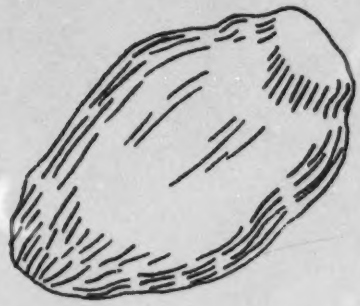


Bean or Pea

Coconut Fruit



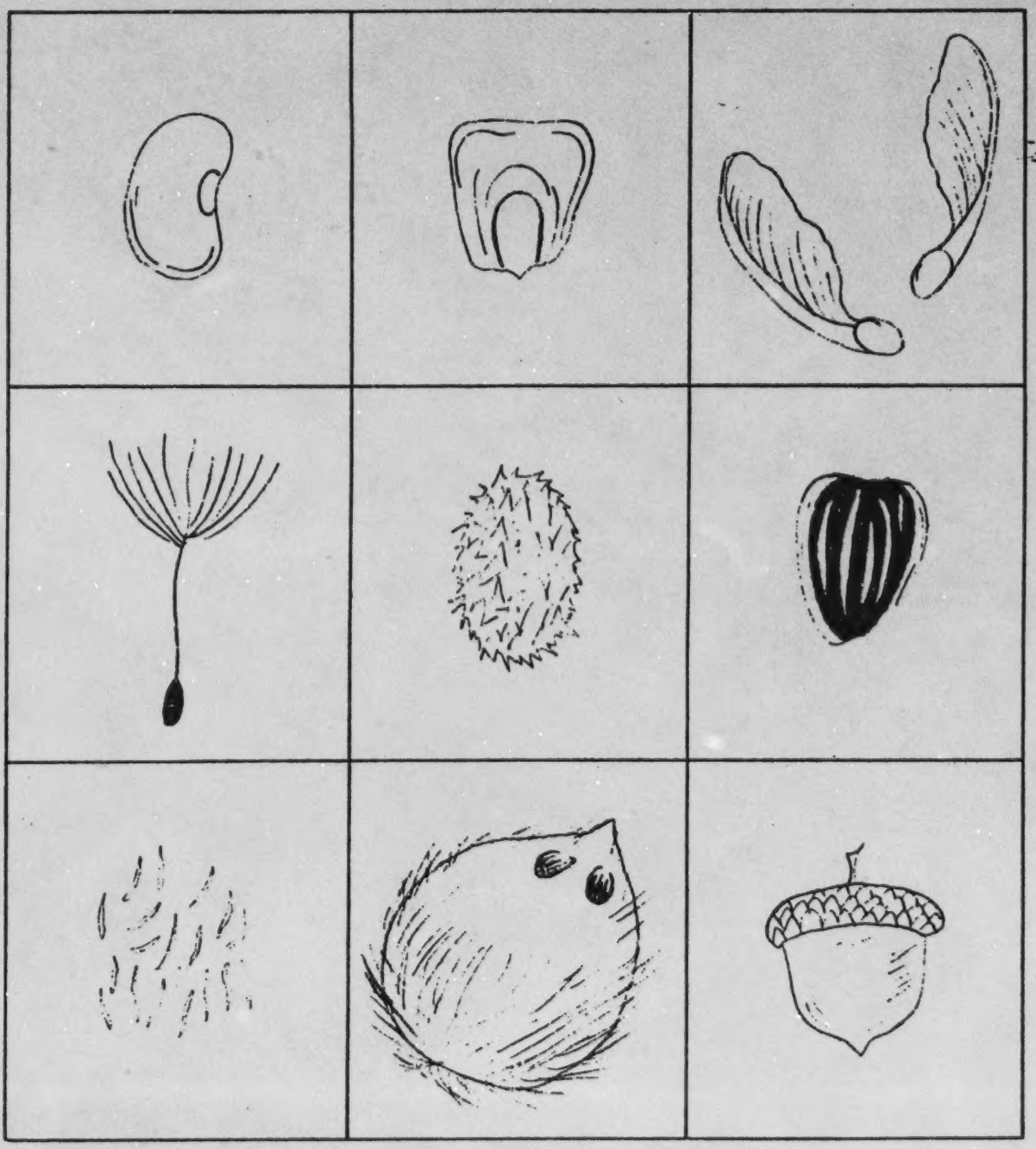
Pumpkin



INVESTIGATION #4:
Seeds

NAME _____

WORKSHEET #4



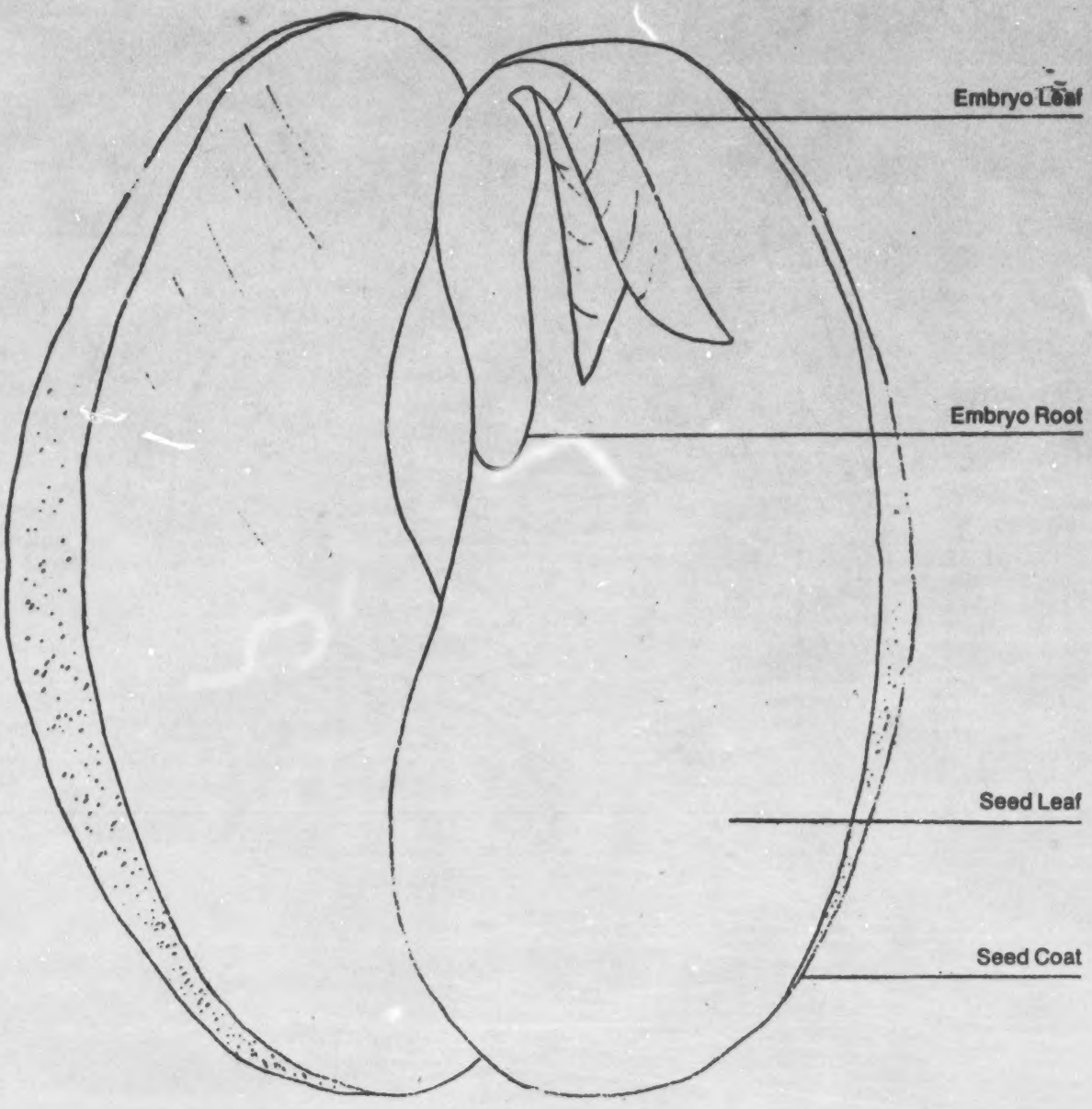
1. Name two kinds of seeds we eat. _____, _____
2. Name two kinds of seeds that come from trees. _____, _____
3. Circle the seed that is covered with sharp, little hooks.
4. Color seeds you have seen.

40

INVESTIGATION #4:
Seeds

NAME_____

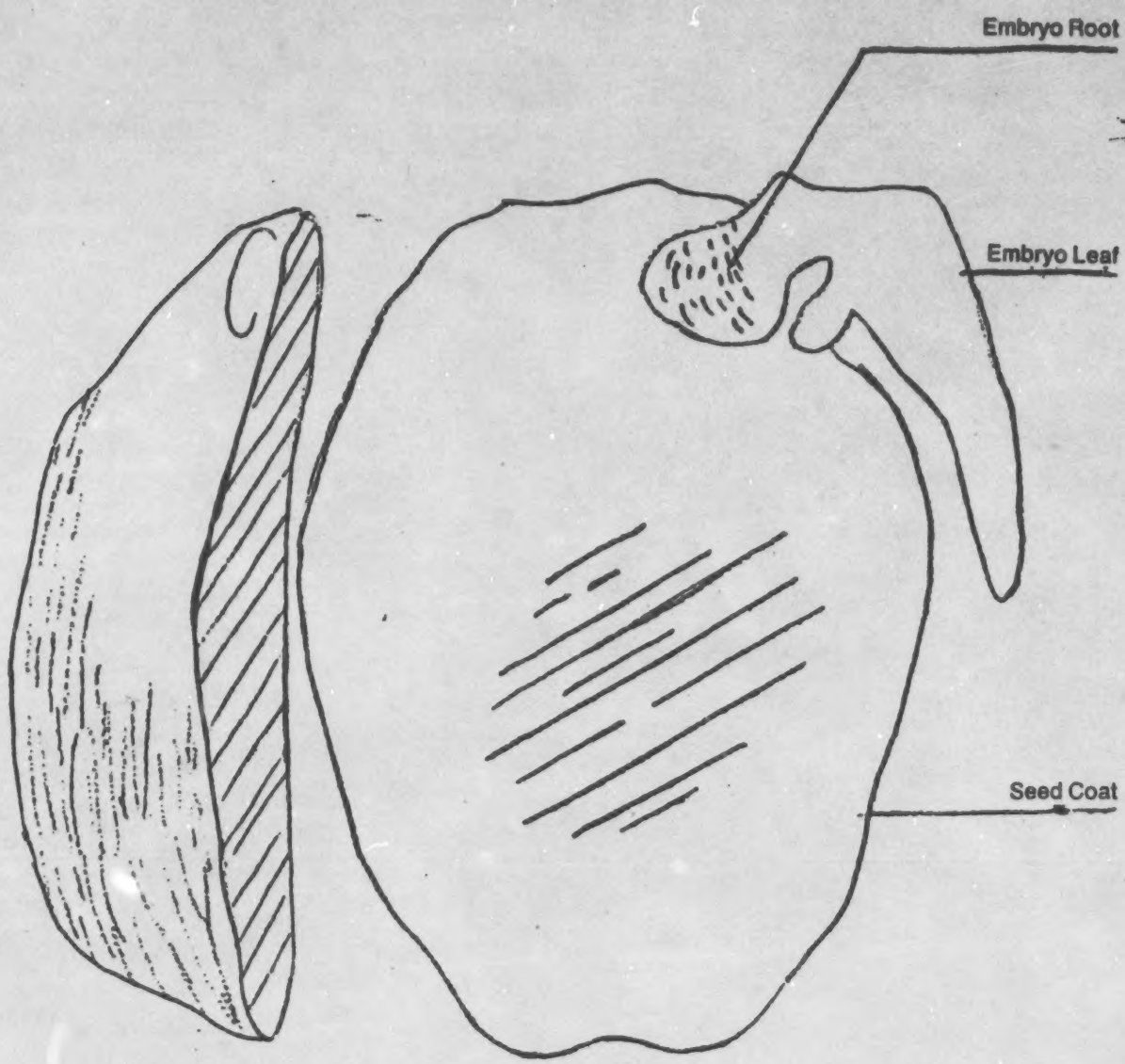
WORKSHEET #5-A



INVESTIGATION #4:
Seeds

NAME_____

WORKSHEET #5-B



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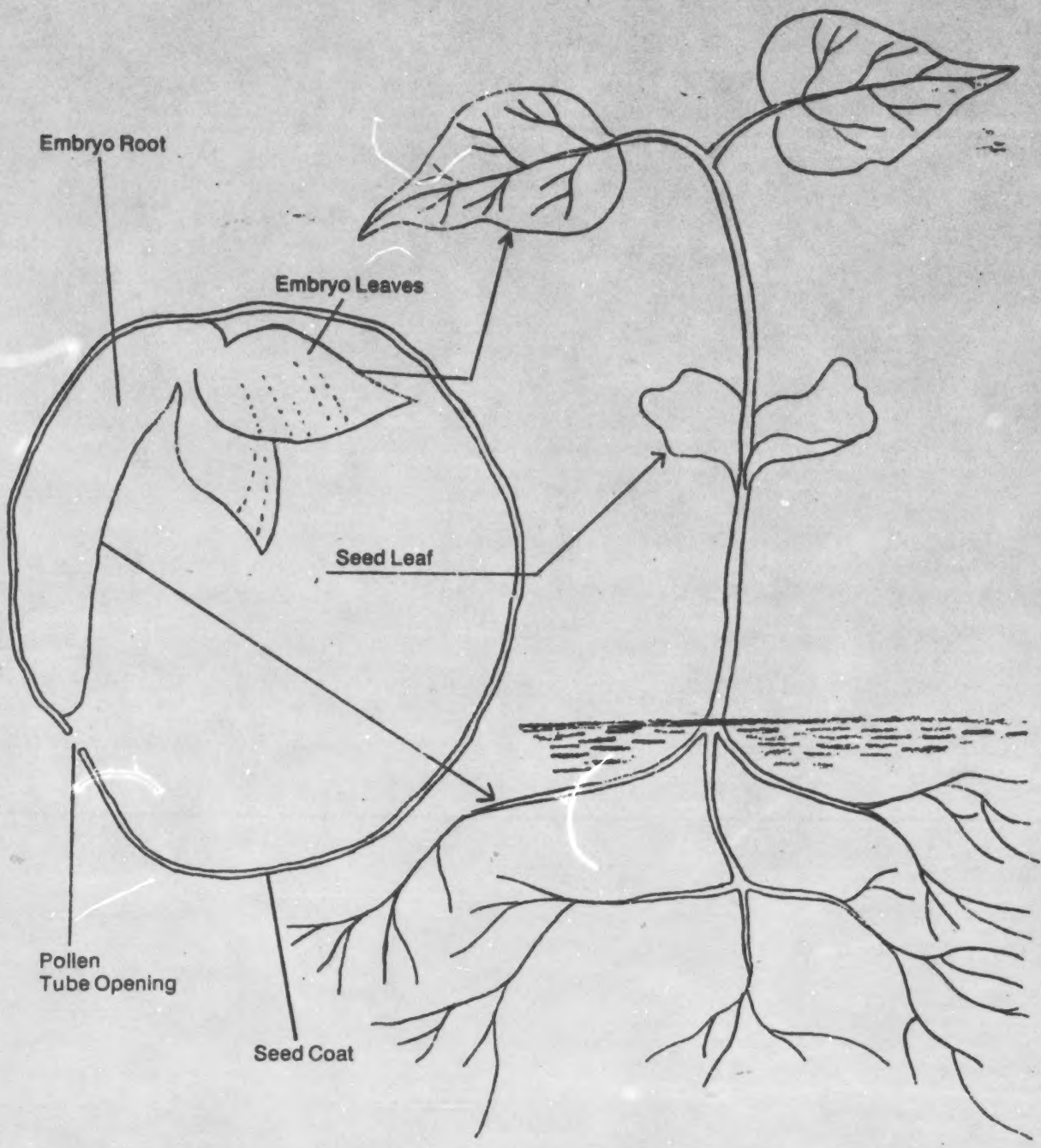
INVESTIGATION #4:
Seeds

NAME_____

WORKSHEET #5-C

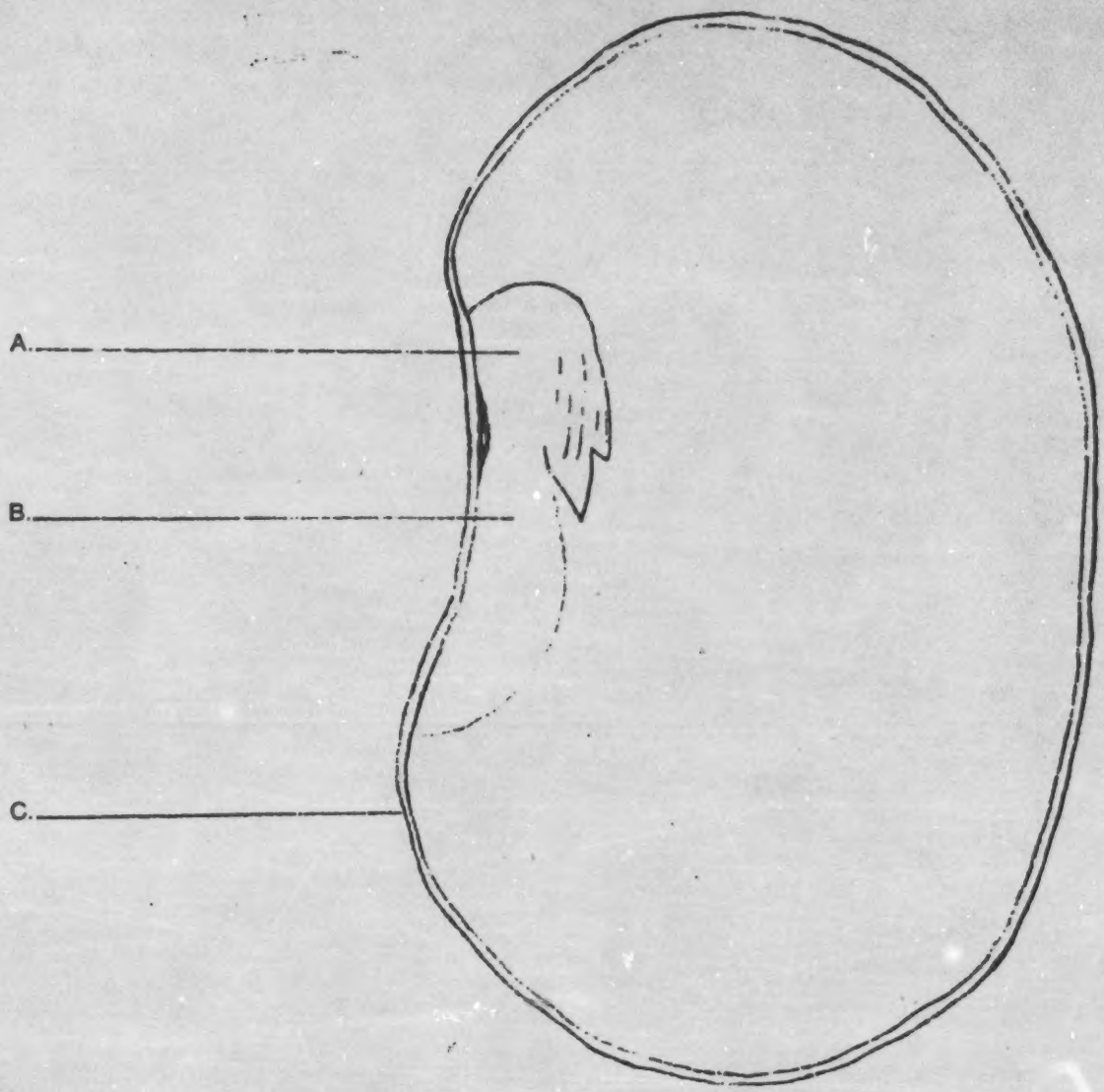


INVESTIGATION #4:
Seeds

NAME _____

WORKSHEET #5-D

Label each seed part



44

INVESTIGATION #4:
Seeds

NAME_____

WORKSHEET #6

Adding water to seeds is an event. What change will the event cause? A paper towel garden will help you find out.
Your team will need these materials:

set of seeds	wax crayon
2 paper towels	water
aluminum pan	

1. Use a wax crayon. Draw nine squares on a paper towel. Write the name of a seed in each square. Put your team number on the towel.
2. Put the towel in a pan. Put ONE seed in each square beside its name.
3. Cover the seeds with another paper towel. Add ¼ cup of water to the pan.
4. Stack the pans of all teams one on top of the other.

Observe the seeds each day. Do not handle them.

1.

BEAN	PEA	CORN
		TEAM 3.

2a.

TEAM 3.	PEA	BEAN
WHEAT	SUNFLOWER	CORN
SORGC	LENTIL	RADISH

2b.

3.

4.

INVESTIGATION #4:
Seeds

NAME_____

WORKSHEET #7

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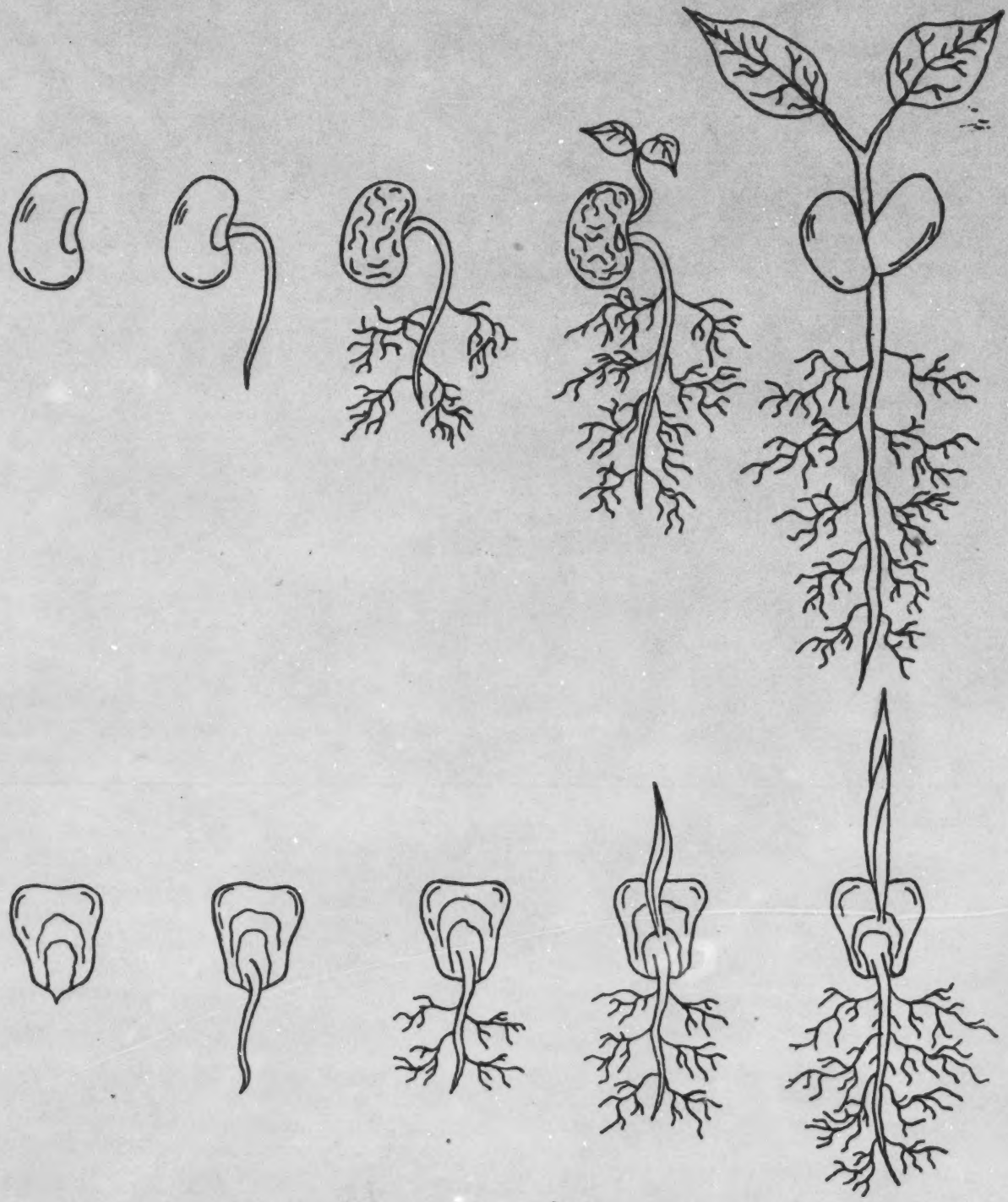
INVESTIGATION #4:
Seeds — How They Grow

NAME_____

WORKSHEET #8



INVESTIGATION #4:
Seeds

NAME _____

WORKSHEET #9

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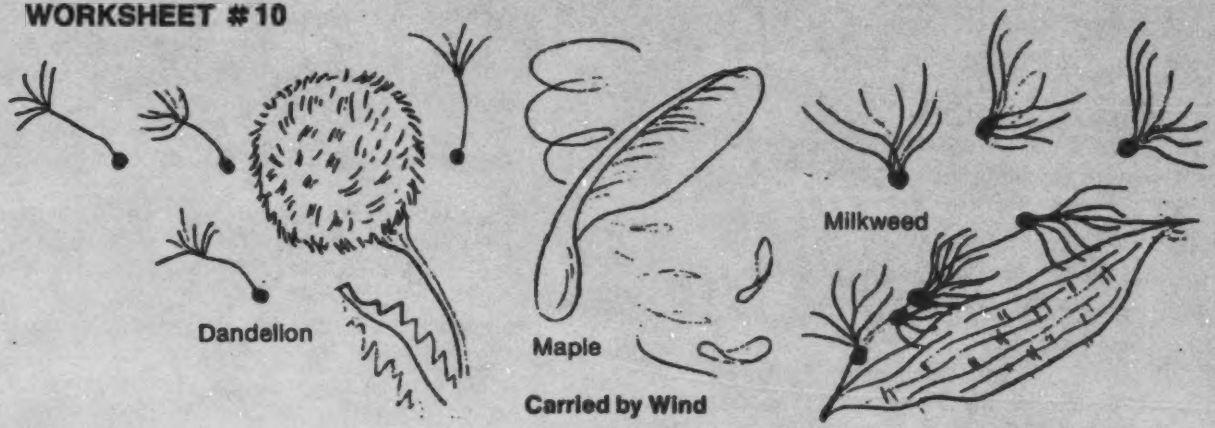
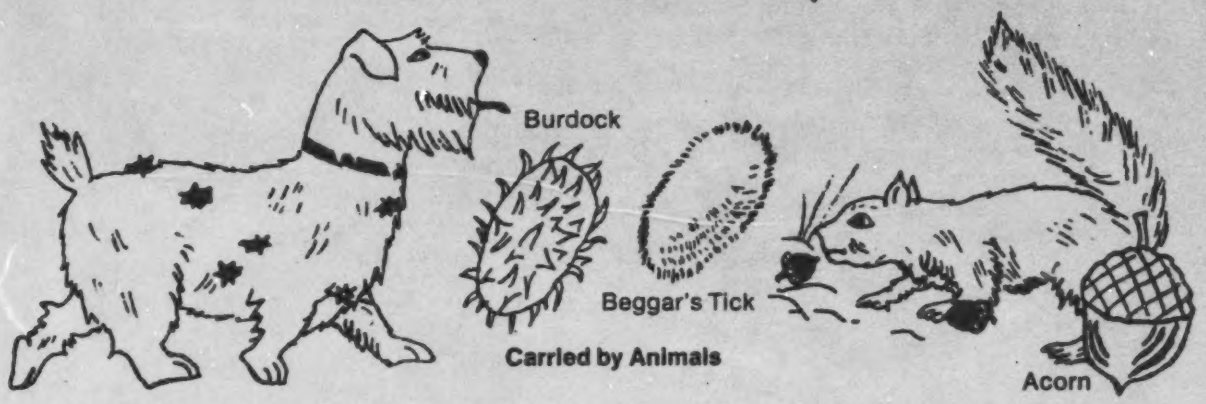
INVESTIGATION #4:
Seeds — How They Travel

NAME_____

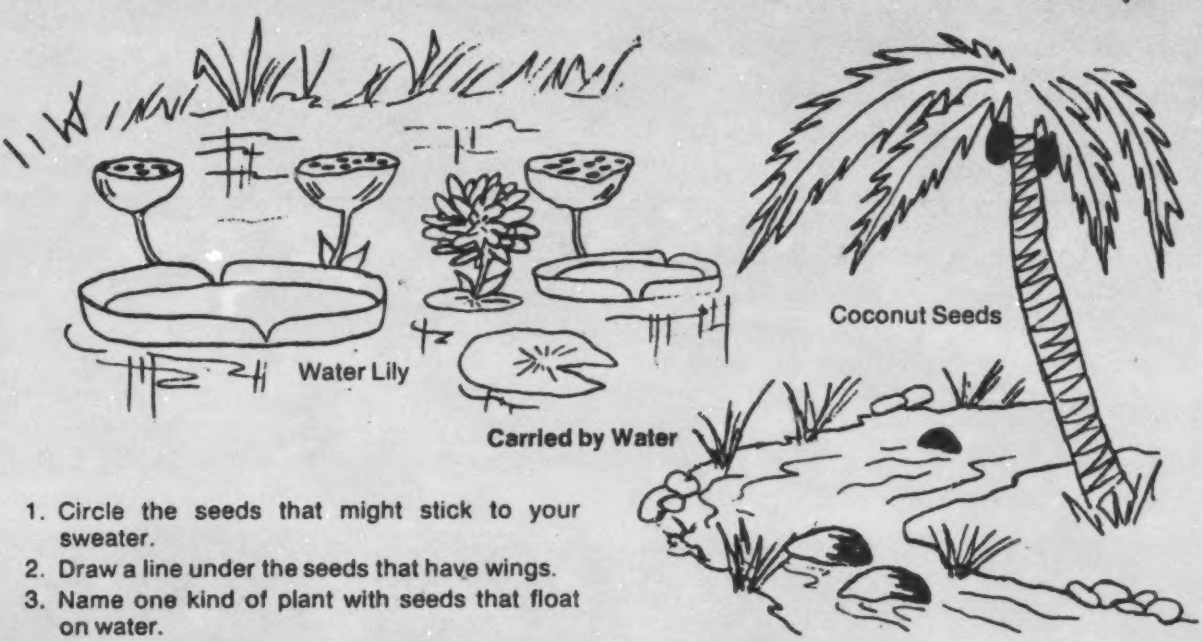
WORKSHEET #10



Carried by Wind



Carried by Animals



Carried by Water

1. Circle the seeds that might stick to your sweater.
2. Draw a line under the seeds that have wings.
3. Name one kind of plant with seeds that float on water.
4. Color the seeds that you have seen.

INVESTIGATION #5
How Plants Grow

RATIONALE

This investigation is designed for the express purpose of demonstrating the conditions necessary for plant growth.

TERMINAL OBJECTIVE

The student will be able to experimentally determine the conditions necessary for plant growth from seed to maturity.

INSTRUCTIONAL OBJECTIVE #1

The students will experimentally determine the effects on the vertical growth of plants.

Suggested Activities:

1. Plant corn, beans and potatoes so that all conditions are the same except that one set of plants will be grown in a dark closet — one set will be grown in the classroom window.
   a) Graph the growth of each plant using activity *Worksheet #1.*
   b) Compare the plants in terms of color, thickness of stem and other visible physical differences.
2. Set up three experimental plant beds and seed with fifty beans in each. Plant and water as instructed in *Worksheet #2.*
   a) Keep a record of how many seeds actually germinate and grow in each bed. Graph this information.
   b) Infer why some beds had a more successful germination than others.
   c) Keep a daily log of the healthiest plant in each bed. Record and graph the heights. Use activity *Worksheet #3.*
   d) Infer why one plant was more successful than another.

INSTRUCTIONAL OBJECTIVE #II

The student will be able to identify the four major parts of a flower and describe their function.

Suggested Activities:

1. Identify the four major parts of a flower (sepals, petals, stamen and pistil) by viewing a transparency. *Worksheet #4 Series.*
2. Answer the questions found on *Worksheet #5.*
3. Dissect a fresh flower and label the four major parts.
4. Make a data chart and record the number of petals, stamens, pistils and sepals that are found on five different flowers. *Worksheet #6.*
5. Discuss the functions of the stamen and the pistil.
6. Gently shake several different kinds of flowers on a sheet of dark paper. With a hand lens observe the pollen and describe similarities and differences.
7. Identify the part of the flower where seeds will form.
8. Make a fun film flower as described. *Worksheet #7.*

INSTRUCTIONAL OBJECTIVE #III

Discuss the importance of pollination in the life cycle of plants and how pollination takes place.

Suggested Activities:

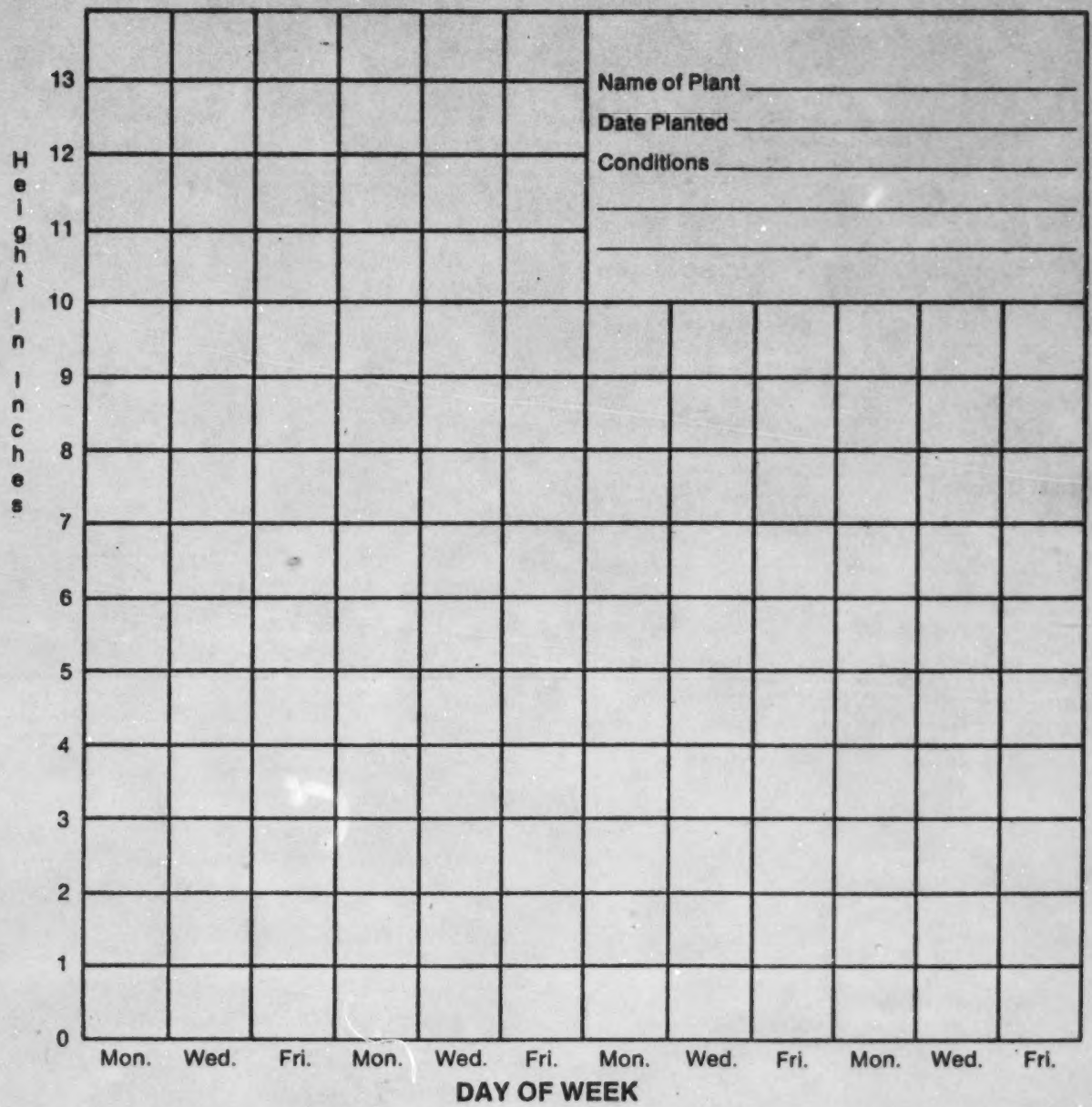
1. Using *Worksheet #8 Series,* the students will discuss how insects help in pollination.
2. Take a scalpel and cut a pistil in half. Look at *Worksheet #9.*
3. Study the inside of a pistil. Make a drawing of a cross section of a pistil.
4. Using *Worksheet #8-G,* have students locate the ovary and lead a discussion on the purpose of the ovary.

INVESTIGATION #5:
Graphing Growth

NAME _____

WORKSHEET #1C

Instructions:
When a plant starts to grow, keep a daily record of each plant's growth by making a graph like the one shown on this page, using a piece of stiff, white cardboard. Paste a colored strip of paper on each day column that will show the height of the plant on that day. If possible, take the readings on Mondays, Wednesdays and Fridays.



INVESTIGATION #5
Experimental Plant Beds

NAME _____

WORKSHEET #2

A. Set up three plastic shoe box gardens as follows:

Garden No. 1—Place 2½ inches of moistened vermiculite in a plastic shoe box and plant fifty bean seeds ½ inch below the surface.

Garden No. 2—Place 2½ inches of top soil in a plastic shoe box and plant fifty bean seeds ½ inch below the surface.

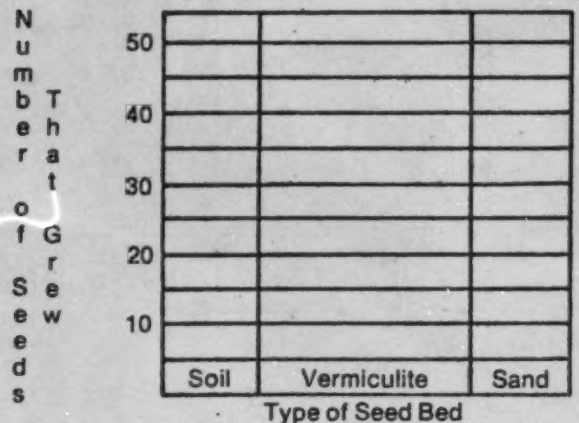
Garden No. 3—Place 2½ inches of sand in a plastic shoe box and plant fifty bean seeds ½ inch below the surface.

B. Water each box daily. Be sure that the same amount of water is added to each box.

C. Plant the same kinds of bean seeds in each box.

D. Keep the three boxes on a window ledge next to each other.

E. After the beans have grown an inch or two, count how many of the fifty bean seeds actually grew in each box. Show the results on the following graph:



G. If you answered the questions in Item "F" correctly and did the experiment as instructed, the only difference in the three boxes was the material used.
Did the beans start to grow best in vermiculite, soil or sand?_____
Which material was the poorest "stuff" for starting seeds?_____

H. Discuss why more seeds started growing in one box than in another. Your teacher will lead the discussion.

F. Answer the following questions by marking Yes or No with an "X".

Did each box get the same amount of heat?
Yes _____ No _____

Did each box get the same amount of light?
Yes _____ No _____

Did each box get the same amount of water?
Yes _____ No _____

Did each box have the same number of seeds?
Yes _____ No _____

Were the same kind of seeds planted in each box?
Yes _____ No _____

Did each box have the same material in it?
Yes _____ No _____

52

INVESTIGATION #5
Measuring Growth

NAME_____

WORKSHEET #3

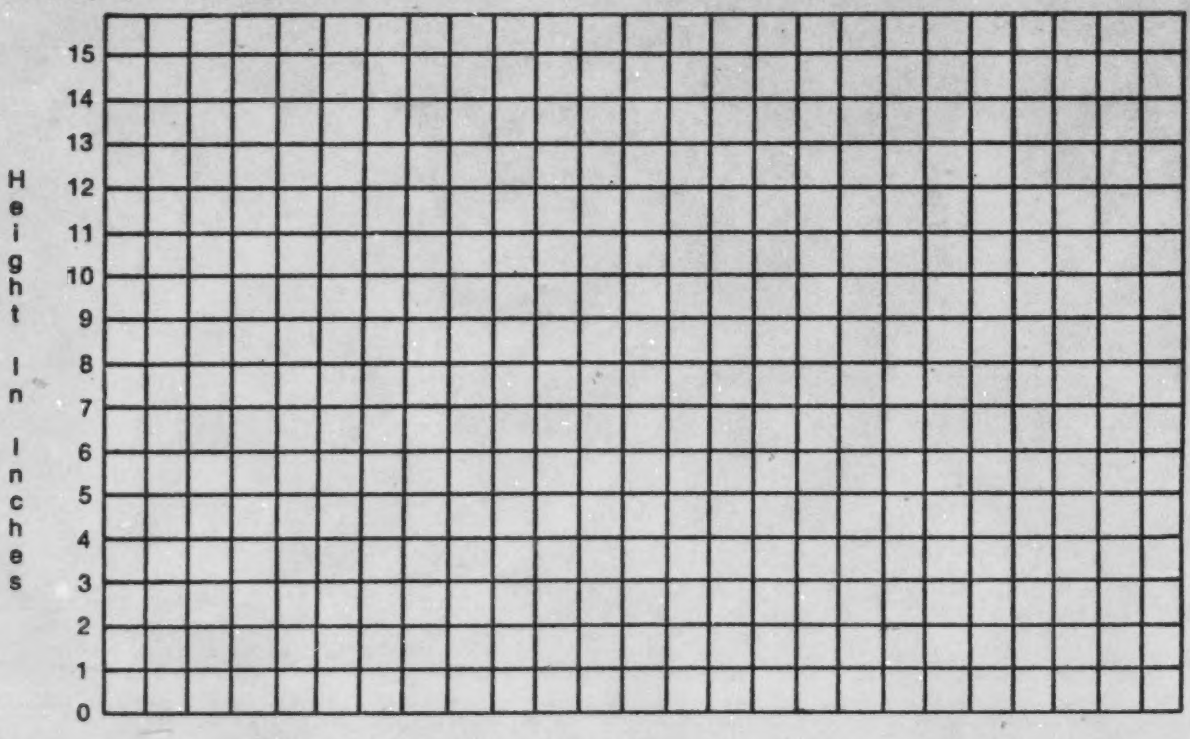
A. Pick a plant from one of the boxes in the last investigation and measure its growth each day. Try to pick one that looks healthy.

Keep your records on this chart.

My Bean Plant

Date Measured	Height In Inches	Date Measured	Height In Inches	Date Measured	Height In Inches

B. Graph your information.

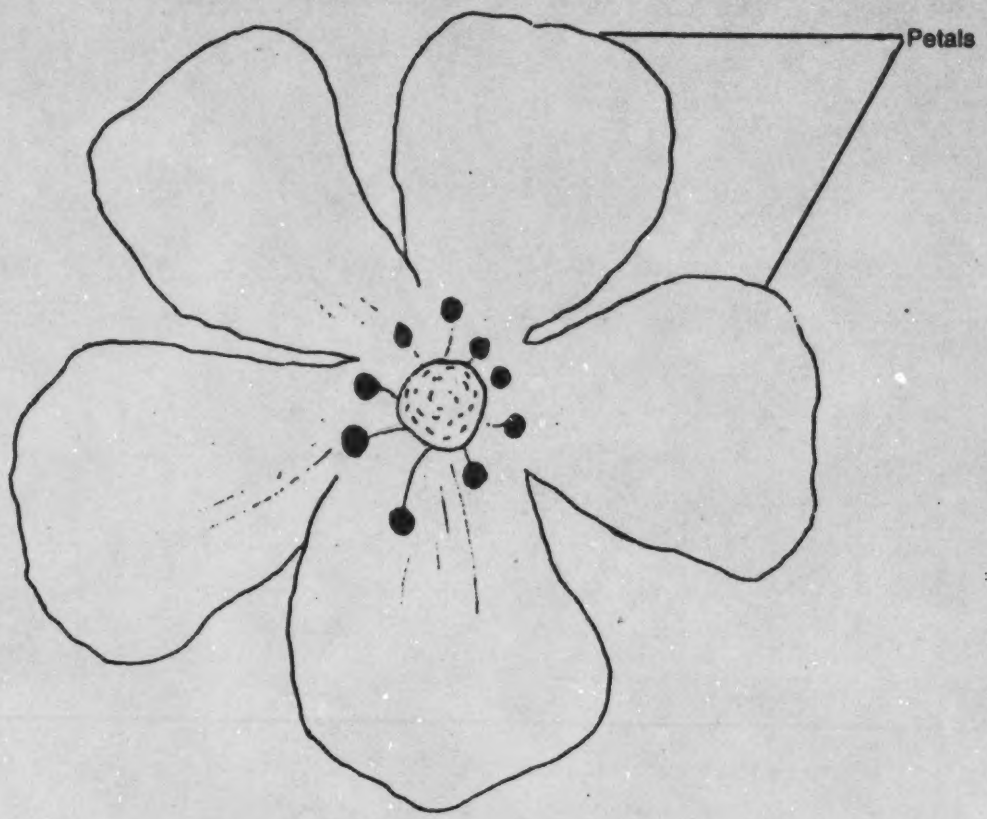


Date of Measurement
(Write in the date under each column.)

INVESTIGATION #5
Flowers

NAME _____

WORKSHEET #4-A



54

INVESTIGATION #5
Flowers

NAME_____

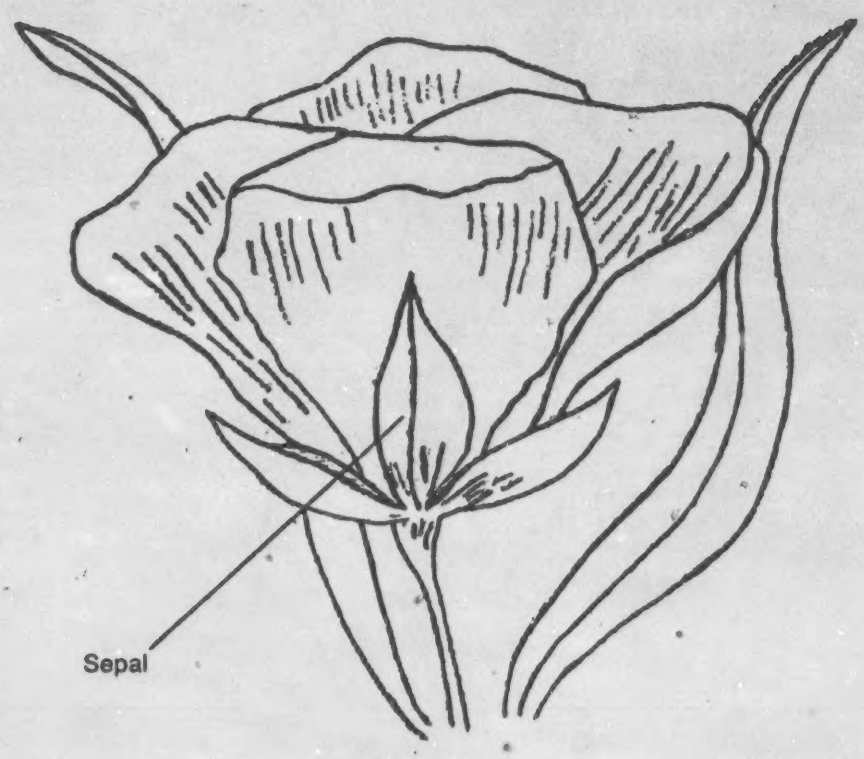
WORKSHEET #4-B

Sepal making a protective coat around a flower bud.

INVESTIGATION #5
Flowers

NAME_____

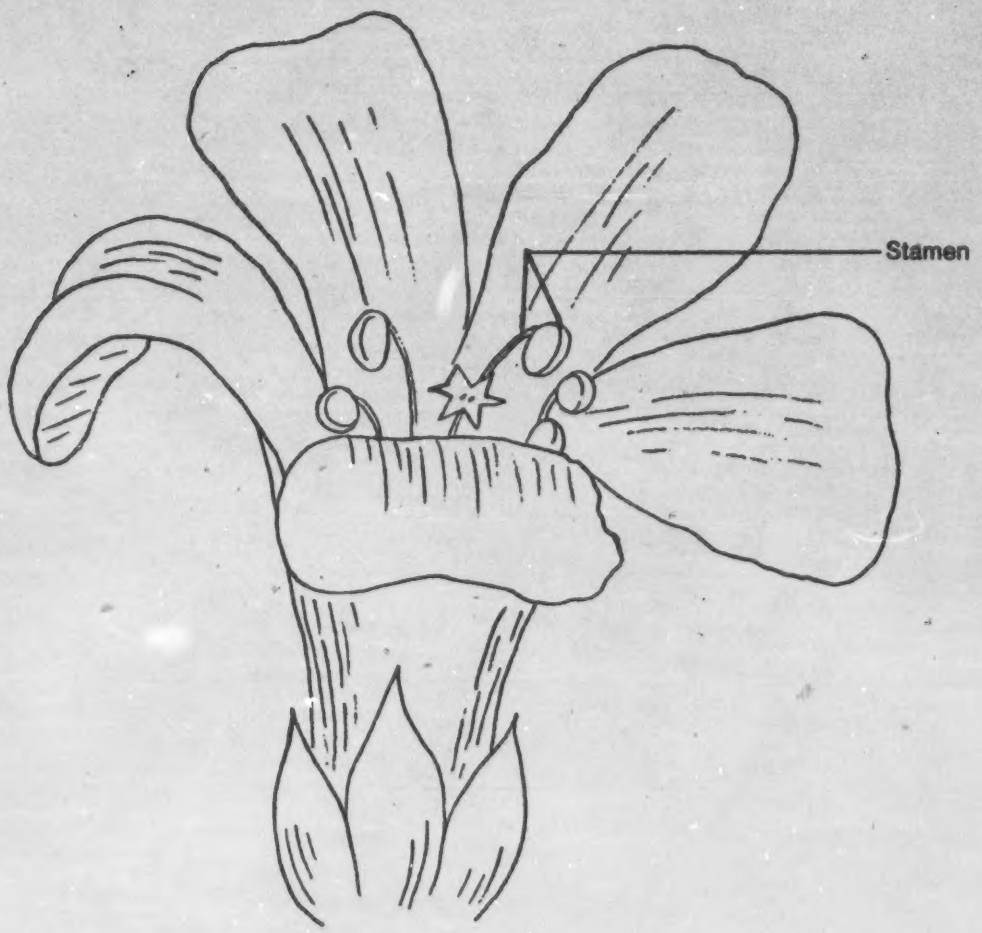
WORKSHEET #4-C



INVESTIGATION #5
HOW PLANTS GROW—Flowers

NAME_____

WORKSHEET #4-D

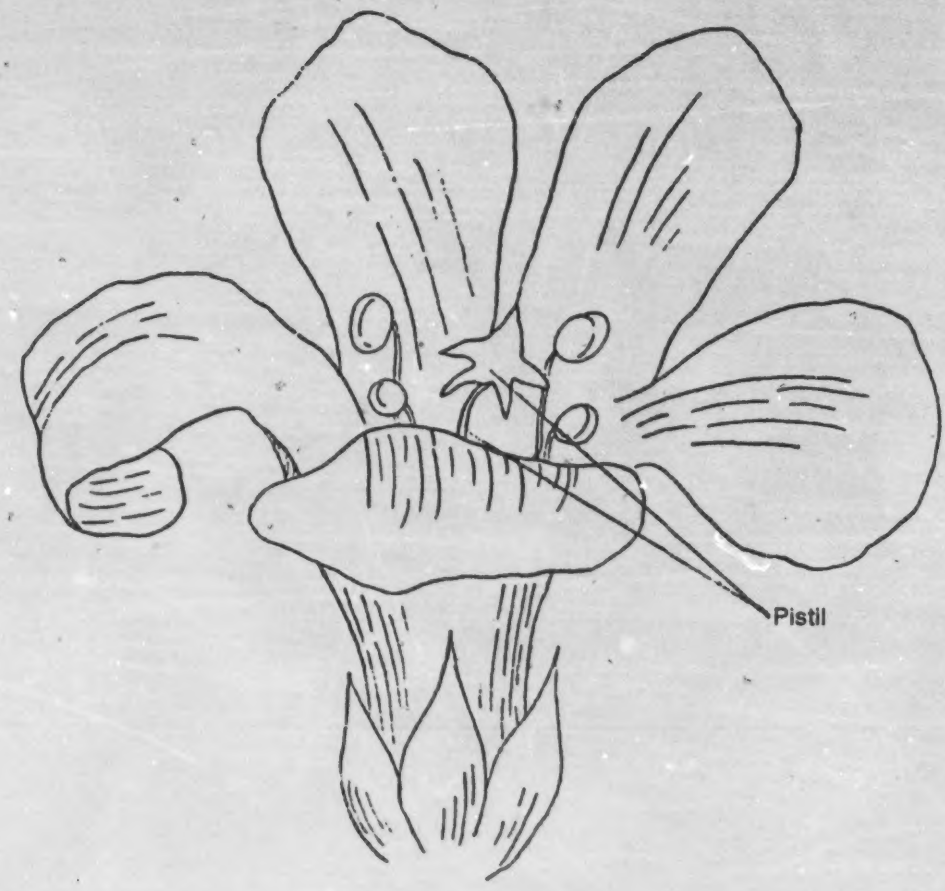


57

INVESTIGATION #5
Flowers

NAME _____

WORKSHEET #4-E



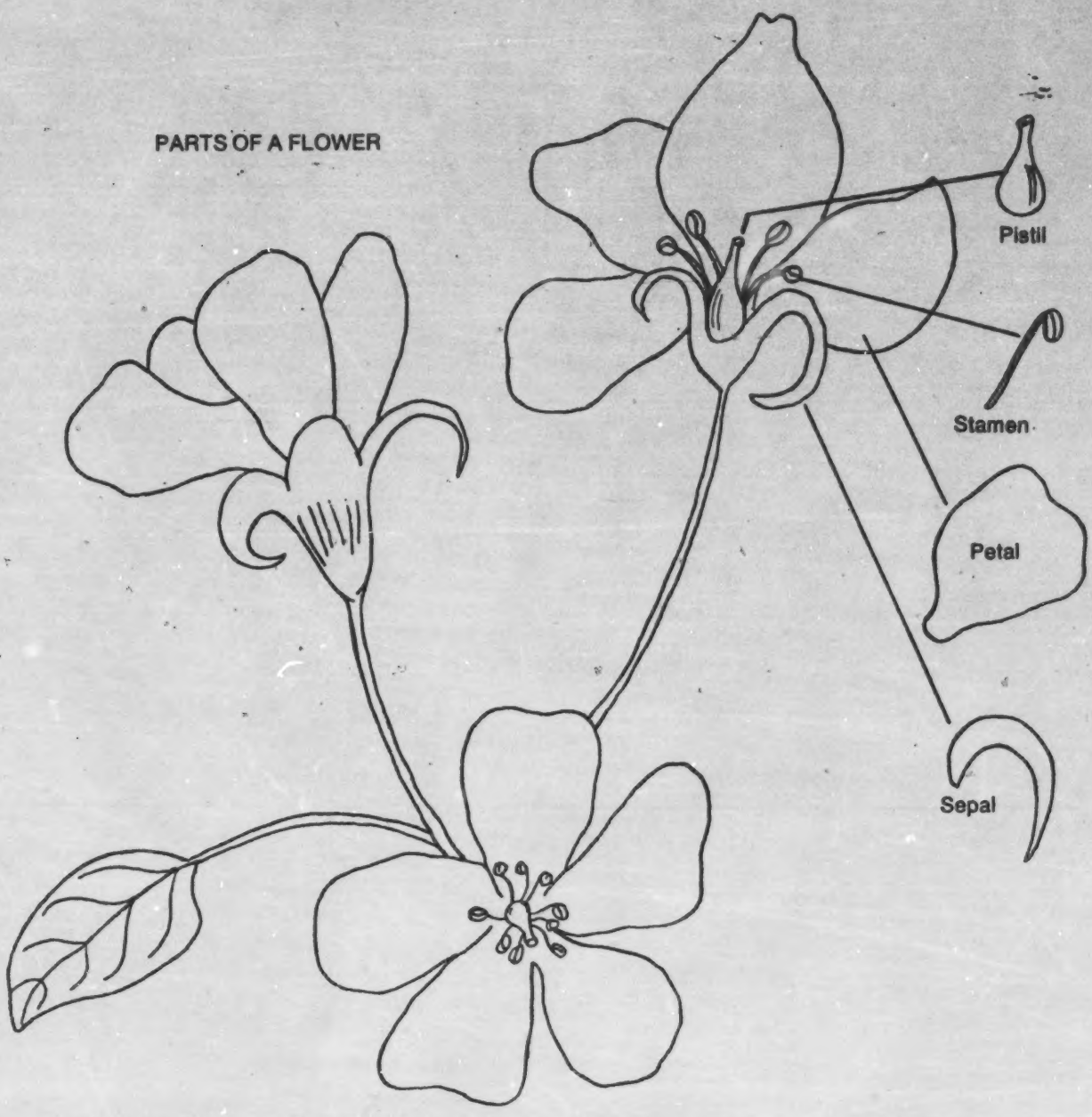
58

INVESTIGATION #5
Flowers

NAME_____

WORKSHEET #4-F

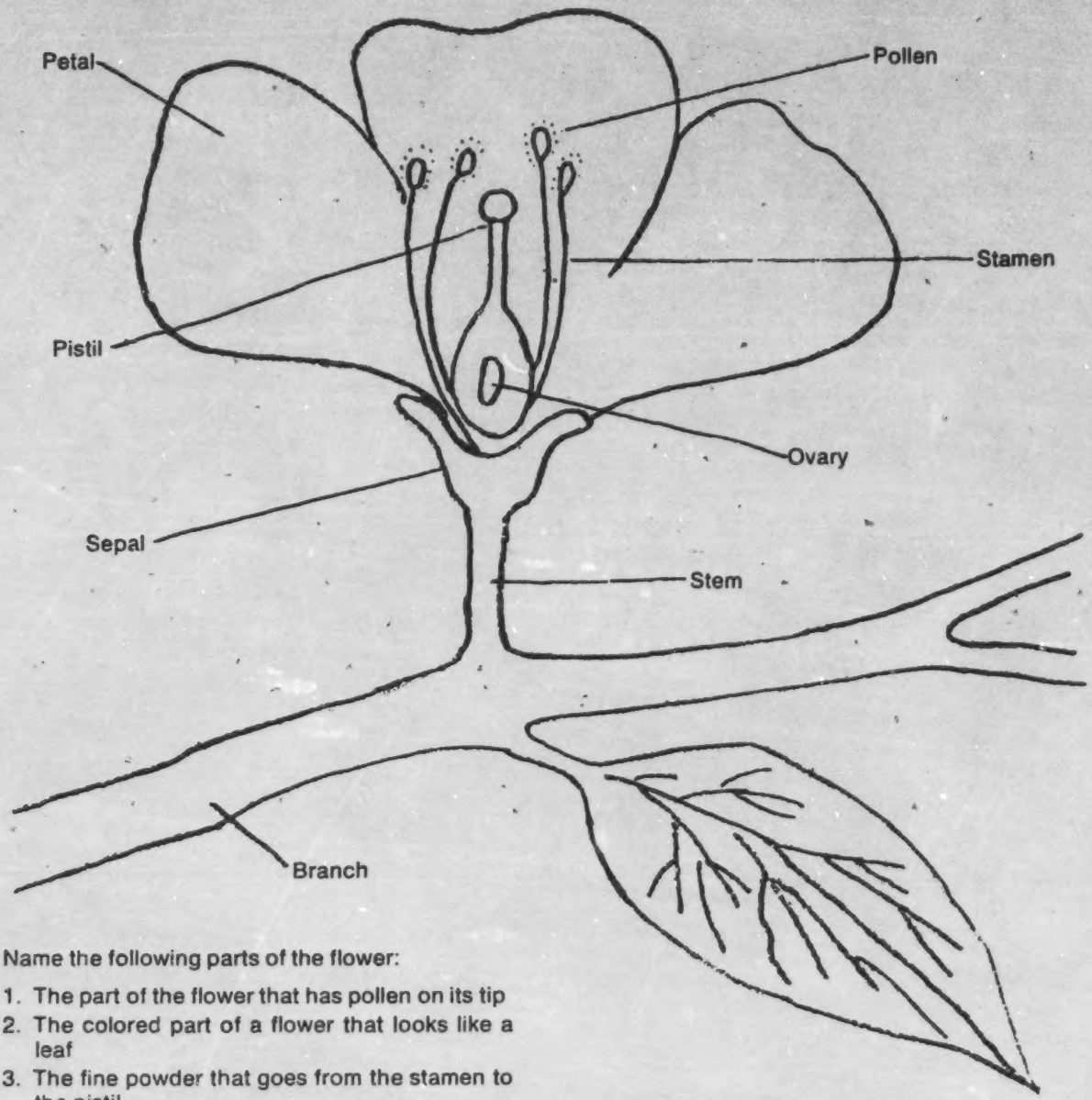
PARTS OF A FLOWER



INVESTIGATION #5
Flowers

NAME _____

WORKSHEET #4-G



Name the following parts of the flower:

1. The part of the flower that has pollen on its tip
2. The colored part of a flower that looks like a leaf
3. The fine powder that goes from the stamen to the pistil
4. The leaflike part around the flower base
5. The part of the flower that holds the leaves up to the sun and air.

Circle the part of the plant that joins the flower to the branch.

Color each part of the flower a different color.

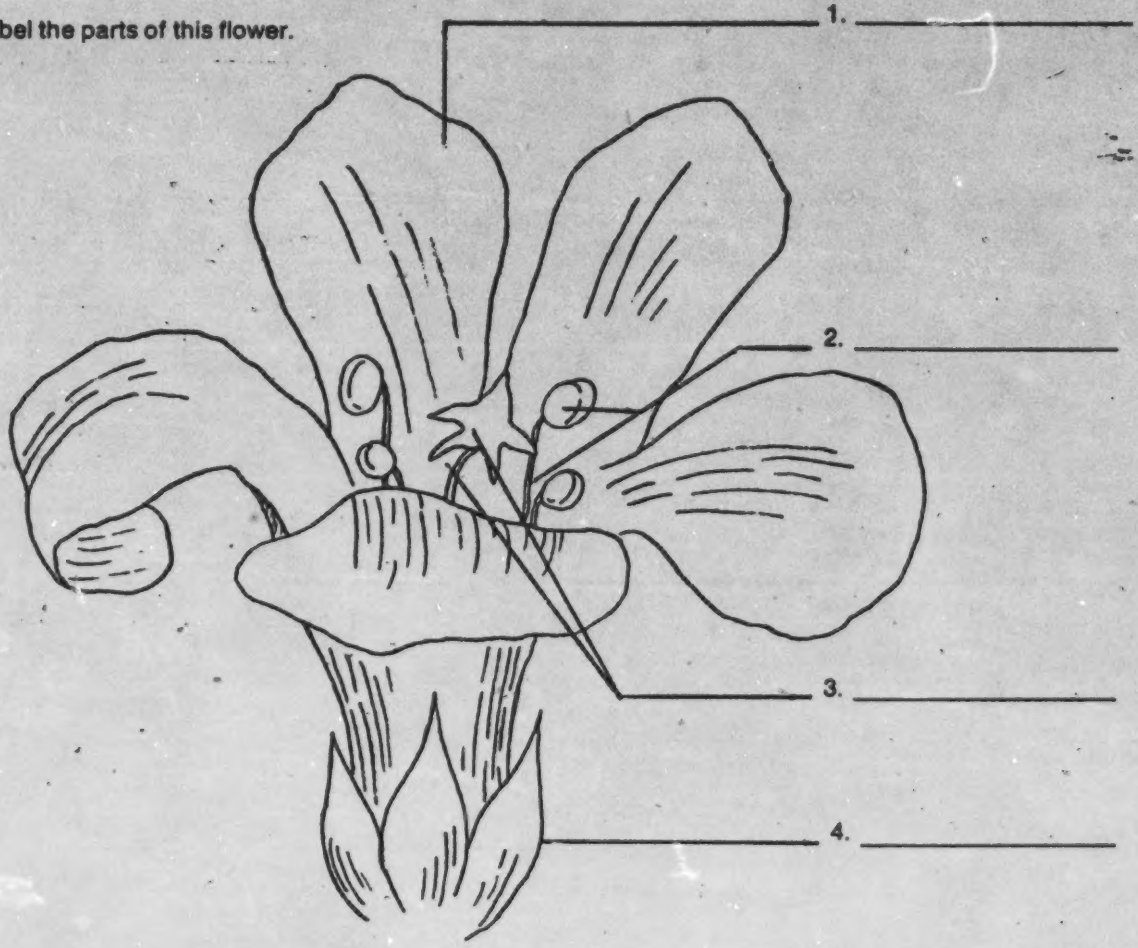
60

INVESTIGATION #5
Flowers

NAME _____

WORKSHEET #5

Label the parts of this flower.



Finish the sentences by filling in the blanks with the correct words from this list.

flowers	roots
leaves	seeds
pollen	sepals
petals	stamens
stems	pistils

1. _____ hold the plant in the soil.
2. _____ are usually the colored parts of a flower.
3. _____ protect the flower bud and usually look like leaves.
4. _____ are the parts of the flower where the pollen is formed.
5. _____ hold the leaves up to the sun and air.
6. _____ make most of the plant food.
7. _____ are the parts of the flower where the seeds grow.
8. _____ is the kind of dust which travels from the stamen to the pistil.

INVESTIGATION #5
Flowers

NAME _____

WORKSHEET #6

A. Your teacher will bring in five different types of flowers from a florist. Count the number of petals, stamens, pistils and sepals on each type and record the information on this chart.

Parts of a Flower

Name of Flower	Number of Petals	Number of Stamens	Number of Pistils	Number of Sepals

B. Which of the flowers have the same number of petals as they have sepals?

_____

_____

_____

_____

C. Do any of the flowers have the same number of stamens as they have petals?

Yes _____ No _____

If so, name them. _____

_____

_____

_____

_____

D. Do any of the flowers have more than one pistil?

Yes _____ No _____

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INVESTIGATION #5
Flowers

NAME_____

WORKSHEET #7

Fun Film Flowers

A. Since making fun film shapes is an activity enjoyed by many people, creating familiar wildflowers should be an exciting project for students. For each flower, the student must find out:
   1. Name of the flower
   2. Color or colors of the flower parts
   3. Names of the flower parts
   4. Number of petals and sepals
   5. Position of pistil and stamens
   6. Leaf shape and position

   Whether or not the finished flower is a perfect replica isn't too important. The purpose of the activity is to take a closer look at flowers. Hopefully, this will lead to a greater awareness and appreciation of the beauty and special characteristics of these representatives of the plant world.

B. Materials needed:
   1. Several cans of the same brand of fun film in colors appropriate to your choice of flowers. Mixing brands may not work.
   2. No. 24 wire for petals, etc. and No. 18 wire for stems
   3. Florist tape
   4. Foam or corrugated cardboard to place shapes in for drying and arranging
   5. Materials for the center of flowers (commercially made centers that can be purchased in hobby shops, thread, yarn, ball fringe, etc.). Try dismantling purchased plastic flowers and sewing their centers together.
   6. Plywood and small nails for forming shapes
   7. Wire cutters

C. Techniques:
   1. Select flowers that are suitable for this material. Those with several medium large petals will be most satisfactory. Tiny, intricate flowers or those with many petals take extreme patience.
   2. Form the wire by hand to fit the patterns. Wrap the wire around small nails in the pattern or plywood or when appropriate, use small jars of uniform size. Smaller shapes can use finer wire and thinner film than larger ones. Leave an inch or so of wire beyond the twist for ease in handling. Make natural curves in the wire before dipping — flat shapes do not look natural.
   4. Stick the dipped parts into styrofoam to dry for about ten minutes. Then, for greater strength with large shapes or more permanency, dip in clear strengthener. This takes about ½ hour to dry so plan your work accordingly.
   5. A little tape around the stem of each petal will keep them from slipping while being assembled. Use fine wire or tape to attach the center to the stem, assemble the petals around the center, bend to proper position, then tape —continue down the stem.
   6. Details may be painted on with acrylics after the flowers are dry. White acrylic on the back of transparent petals will make them opaque if desired.

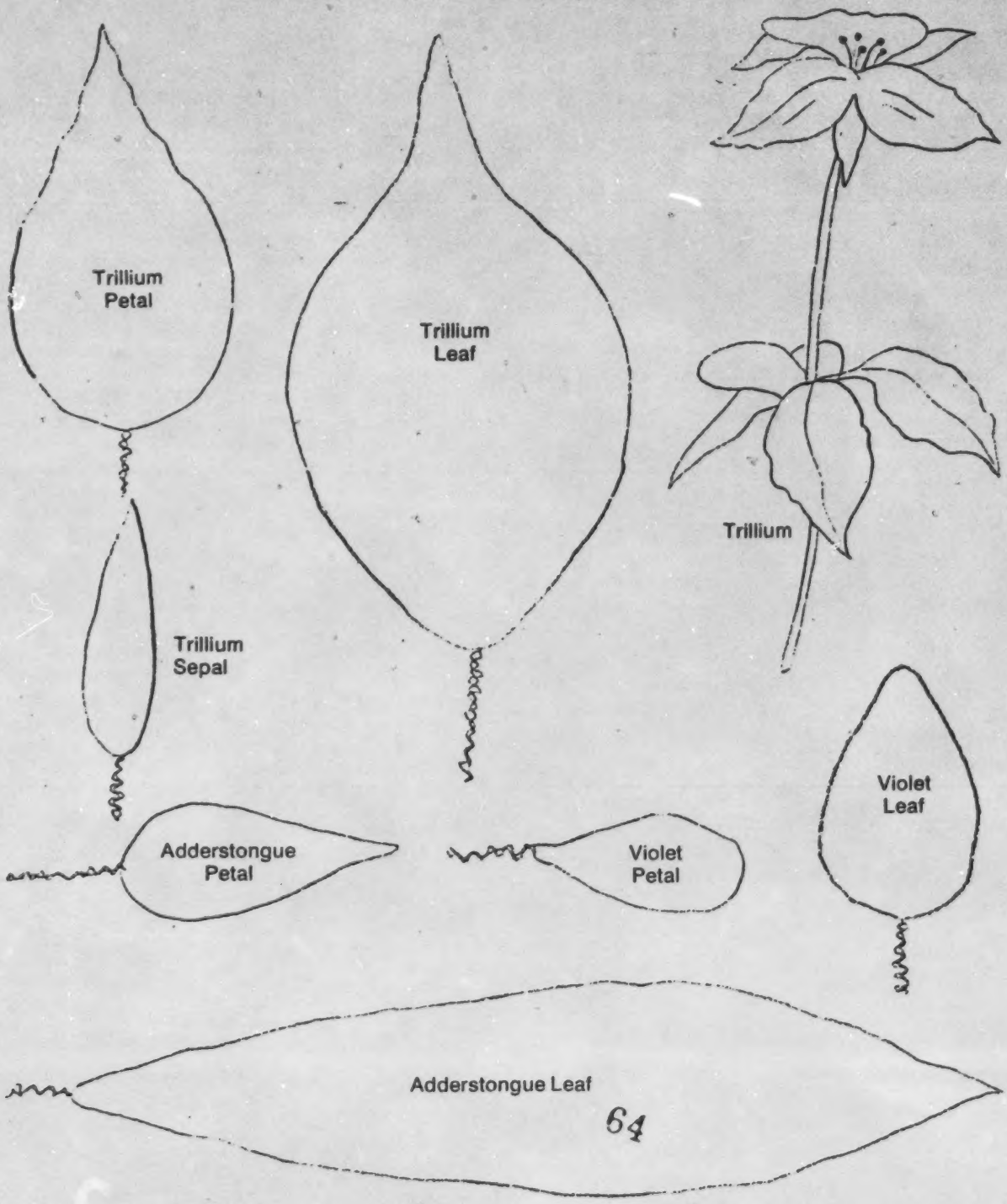
On the following page are wildflower patterns. Another exercise would be to have the students make their own patterns of the wildflowers that they have studied.

INVESTIGATION #5
Flowers

Name _____

WORKSHEET #7

FUN FILM WILDFLOWERS

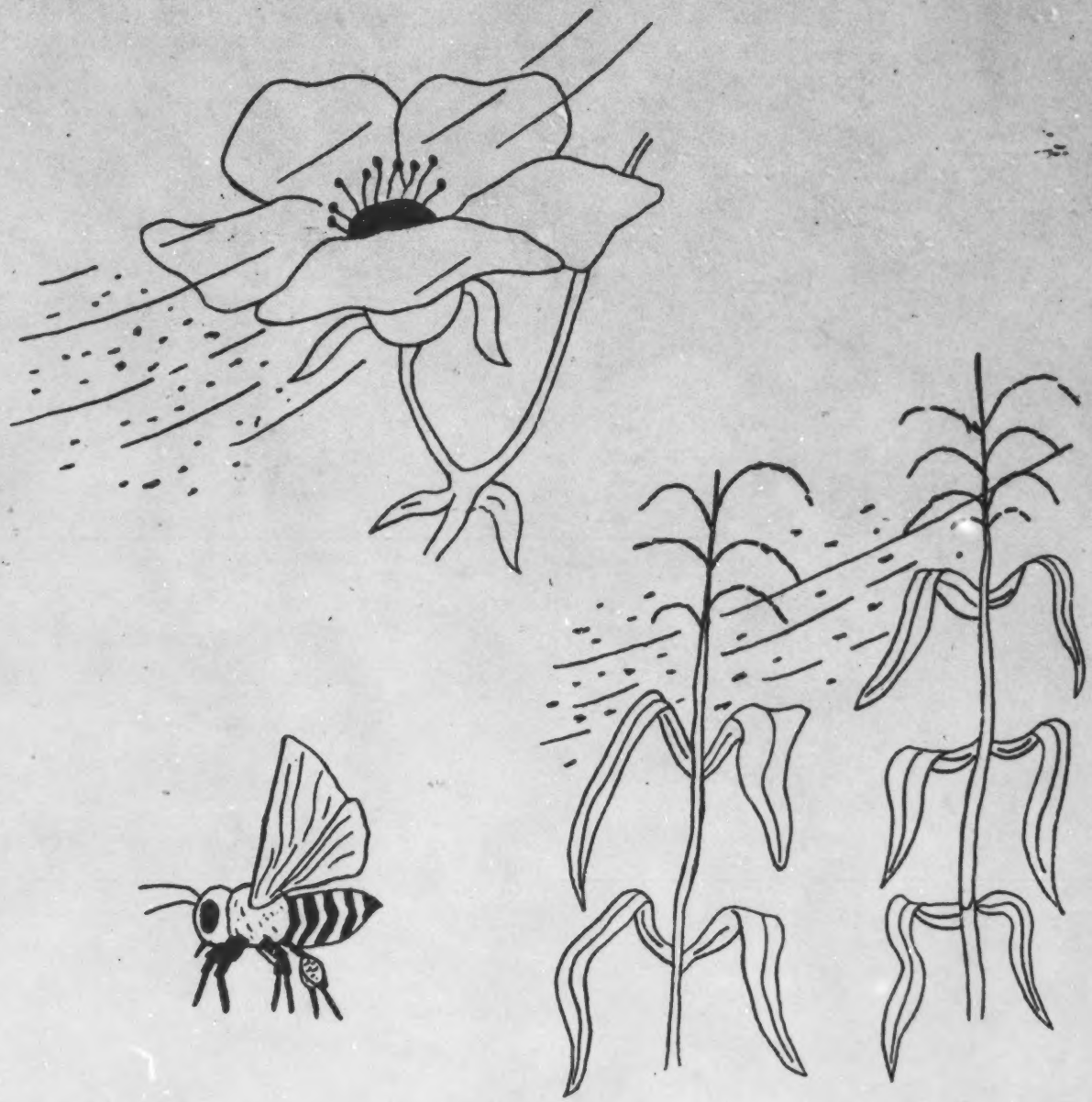


64

INVESTIGATION #5
Flowers

Name _____

WORKSHEET #8-A



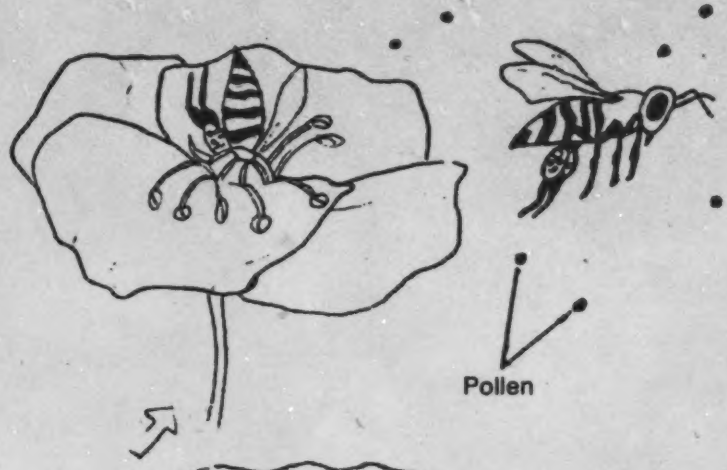
Insects, wind and gravity help pollen travel.

INVESTIGATION #5
Flowers

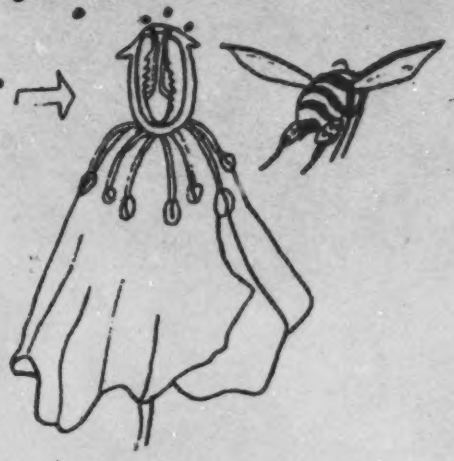
Name _____

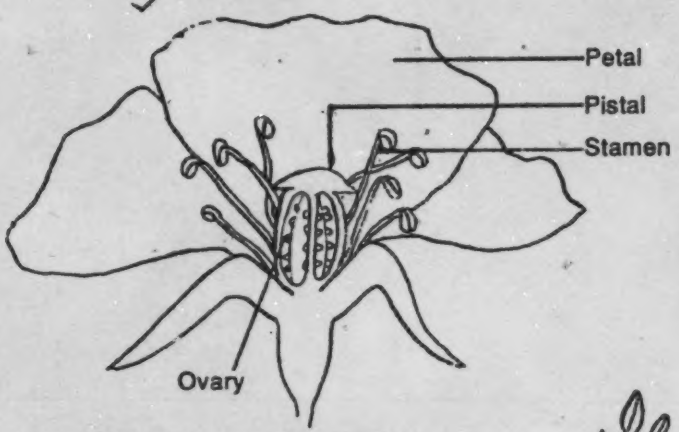
WORKSHEET #8-B

Wind and insects carry pollen from one flower to another.



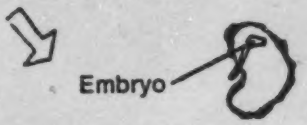
Pollen grains fall on the pistil. Each grain makes a tube that grows down the pistil to the ovary. The embryo then begins to form.

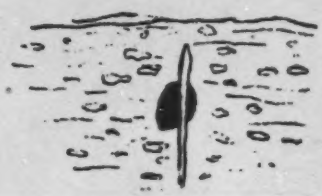




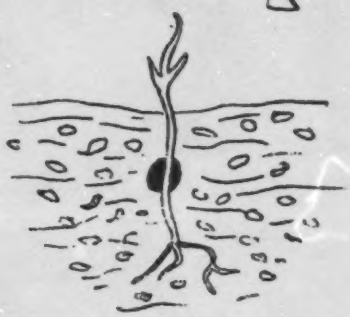
A flower has tiny parts that can come together to make seeds. One of these parts is pollen. Most pollen looks like yellow powder.

Food is stored around the embryo and an outside coat forms. We now have a seed.

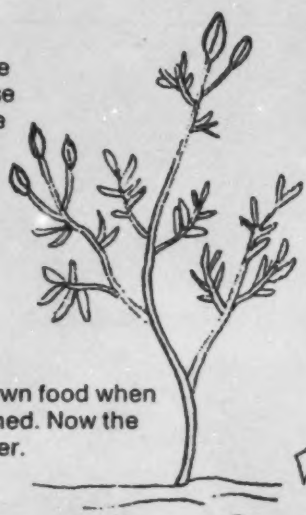




In the ground the seed becomes warm and moist. It begins to grow.



The embryo uses the food from the seed as it becomes a plant.



The plant makes its own food when green leaves are formed. Now the plant can form a flower.

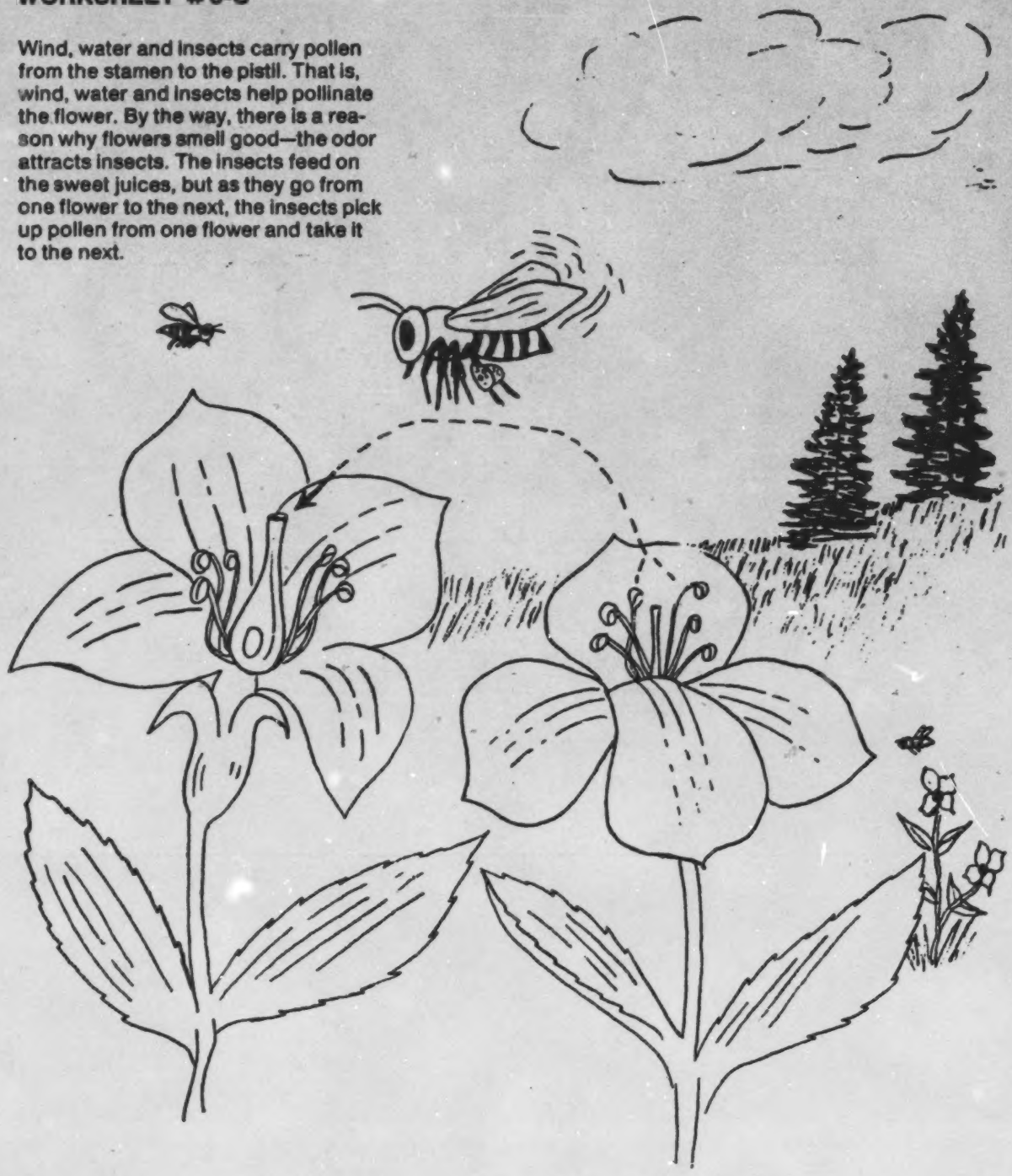
66

INVESTIGATION #5
Flowers

Name _____

WORKSHEET #8-C

Wind, water and insects carry pollen from the stamen to the pistil. That is, wind, water and insects help pollinate the flower. By the way, there is a reason why flowers smell good—the odor attracts insects. The insects feed on the sweet juices, but as they go from one flower to the next, the insects pick up pollen from one flower and take it to the next.

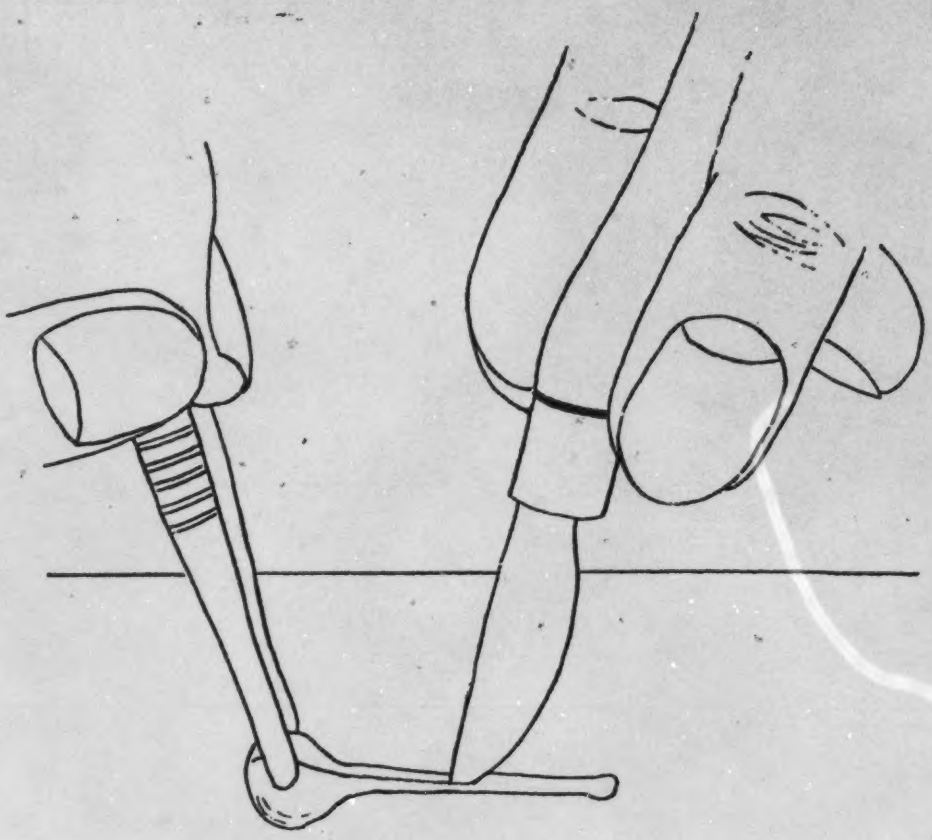


INVESTIGATION #5
Flowers

Name _____

WORKSHEET #9

The female organ of a flower is the pistil. The round object found at the bottom of the pistil is an ovary. The ovary holds the flower's egg cells. When the (male) sperm cell in the pollen joins with one of the (female) egg cells in the ovary, a seed starts to develop.



Use a scalpel and cut a pistil in half from top to bottom.

INVESTIGATION #6
Identification Of Plants

RATIONALE

Plants play an important role in our lives. They produce flowers, vegetables, fruits and seeds that we need in daily living. Students would be able to identify common garden plants.

TERMINAL OBJECTIVE

Students will be able to recognize common plants that humans use for the production of flowers, fruits and vegetables.

INSTRUCTIONAL OBJECTIVE #1

Given a list of plants, the student will correctly identify those used for the flowers.

Suggested Activities:

1. Students should bring to school one of each type of flower they have in their flower bed at home. These flowers should then be displayed in the classroom.
2. Name or list five flowers brought to school.
3. Show slides of flower beds and have students identify the flowers correctly.
4. Using flash cards of flowers, identify each by name.
5. Find the flowers hidden in the puzzle. *Worksheet = 1.*
6. Take a trip to a greenhouse or florist and list five flowers you identified.
7. Color the pictures of flowers found on *Worksheet #2* and identify them.

INSTRUCTIONAL OBJECTIVE #II

Given pictures of five fruit and five vegetable plants, students will be able to identify those in each category.

Suggested Activities:

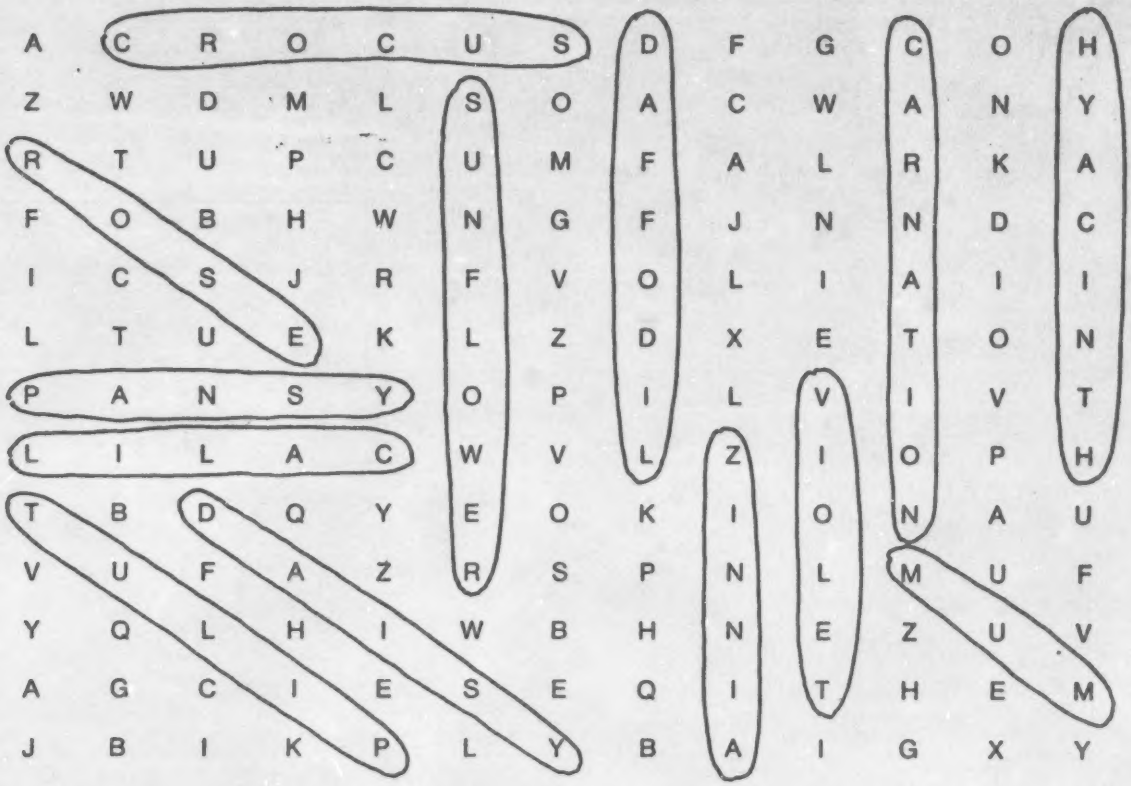
1. Identify common vegetable plants from ten pictures of plants.
2. Using *Worksheet #3,* ask students to put a "yes" under each picture you think is a fruit and a "no" under each picture that you think is not a fruit.
3. Bring into class ten living plants and ask the students to identify those that will produce a fruit and those that will produce a vegetable. If done in the spring and after the last frost, the plants can be transplanted in the school yard and observed until the close of school.
4. Use the flip cards of plants and identify each by name and category.
5. Smell three odors and point to the plant that has that fragrance.
6. Take a field trip to a farm and identify the plants the farmer is growing.
7. Super plant—Worksheet #4

INVESTIGATION #6
Puzzle

Name _____

WORKSHEET #1

Find the thirteen flowers hidden in this puzzle.


A C R O C U S D F G C O H
Z W D M L S O A C W A N Y
R T U P C U M F A L R K A
F O B H W N G F J N N D C
I C S J R F V O L I A I I
L T U E K L Z D X E T O N
P A N S Y O P I L V I V T
L I L A C W V L Z I O P H
T B D Q Y E O K I O N A U
V U F A Z R S P N L M U F
Y Q L H I W B H N E Z U V
A G C I E S E Q I T H E M
J B I K P L Y B A I G X Y

ANSWER KEY

INVESTIGATION #6
Puzzle

Name _____

WORKSHEET #1

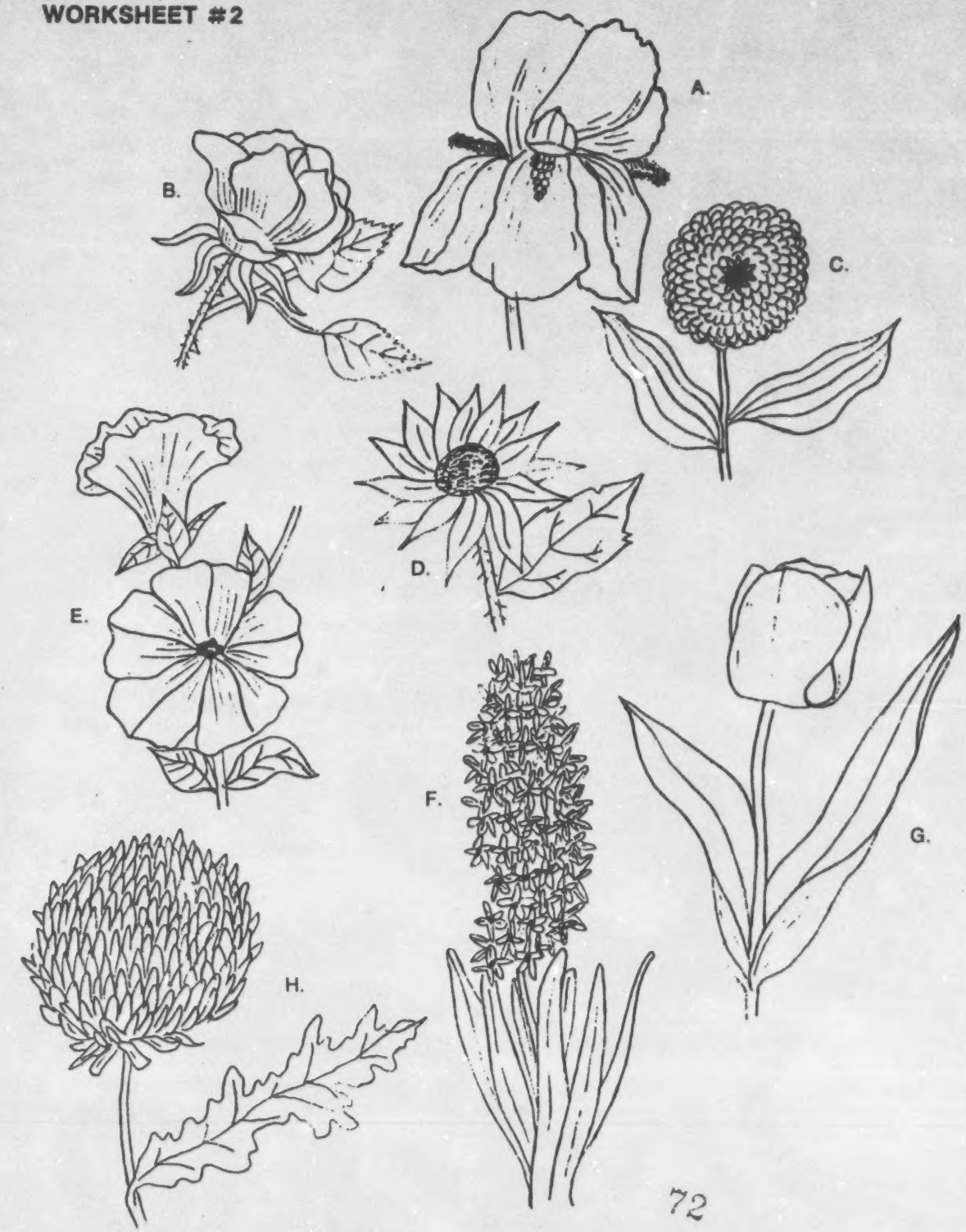
Find the thirteen flowers hidden in this puzzle.

A	C	R	O	C	U	S	D	F	G	C	O	H
Z	W	D	M	L	S	O	A	C	W	A	N	Y
R	T	U	P	C	U	M	F	A	L	R	K	A
F	O	B	H	W	N	G	F	J	N	N	D	C
I	C	S	J	R	F	V	O	L	I	A	I	I
L	T	U	E	K	L	Z	D	X	E	T	O	N
P	A	N	S	Y	O	P	I	L	V	I	V	T
L	I	L	A	C	W	V	L	Z	I	O	P	H
T	B	D	Q	Y	E	O	K	I	O	N	A	U
V	U	F	A	Z	R	S	P	N	L	M	U	F
Y	Q	L	H	I	W	B	H	N	E	Z	U	V
A	G	C	I	E	S	E	Q	I	T	H	E	M
J	B	I	K	P	L	Y	B	A	I	G	X	Y

INVESTIGATION #6
Flowers

Name _____

WORKSHEET #2



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INVESTIGATION #6
Fruits

Name _____

WORKSHEET #3

A. _____

B. _____

C. _____

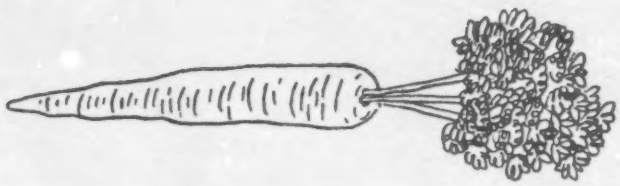
D. _____

E. _____

H. _____

F. _____

G. _____



I. _____

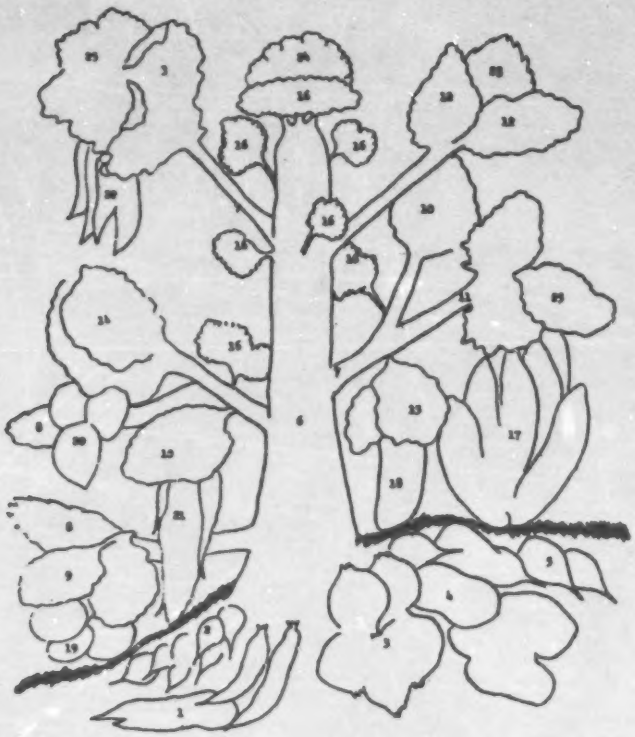
K. _____

J. _____

INVESTIGATION #6
Identification Of Plants — Super Plant

Name _____

WORKSHEET #4



SUPER PLANT

Answer Key

Roots:
1. carrots
2. radishes
3. onions
4. potatoes
5. beets

Stems:
6. celery
7. rhubarb
8. asparagus

Leaves:
9. green cabbage
10. red cabbage
11. chinese cabbage
12. Swiss chard
13. head lettuce
14. romaine lettuce
15. red lettuce
16. parsley

Fruits:
17. bananas
18. cucumber
19. oranges

Seeds:
20. walnuts
21. corn
22. peas

Flowers:
23. artichoke
24. cauliflower
25. broccoli

Instructions:

Have students view the "Super Plant", *Worksheet #4*. Discuss the different foods we eat.

Everybody knows that we eat fruit and that fruits come from plants. Maybe you didn't know that some vegetables are called the fruits of plants, because the fruit part is what carries the seeds. A cucumber is the fruit of a cucumber plant because it has the seeds inside it. And maybe you never stopped to think that we eat other parts of plants, too. Did you know that we eat leaves and stems and seeds and roots and even flowers?

Pictured on the next page is a special "Super Plant" that you'll never see anywhere else. Super because every part of it is a common food. You've probably eaten most of the things on it yourself. See if you can name each food and tell what plant part it is. For example, parsley is a leaf part. Use each food's position on the plant and the way it is growing as clues. If you have trouble with some, check the answer list found on this page. The numbers key into the small drawing of the plant.

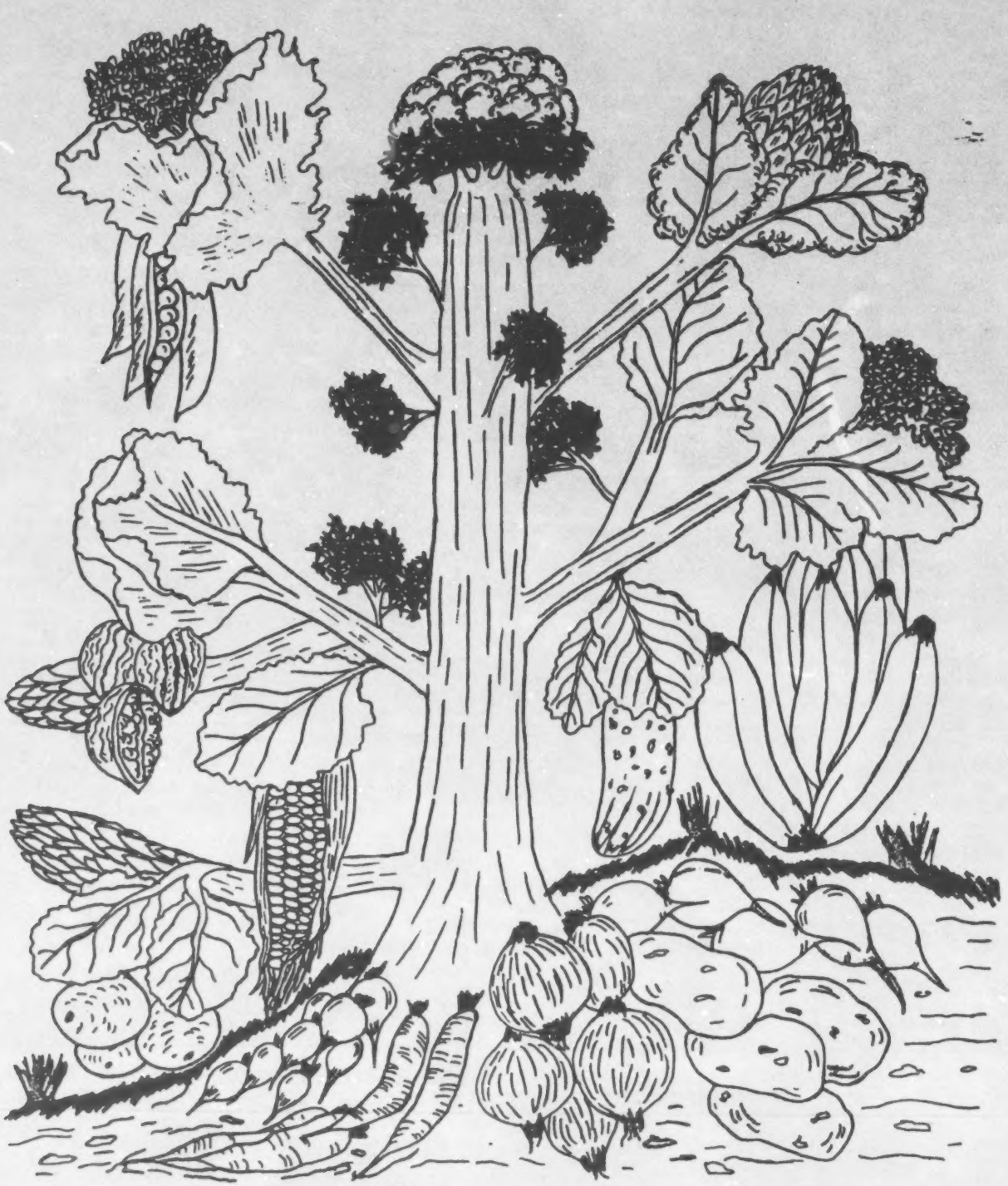
Remember that the foods you are looking for make-up the following plant parts: roots, stems, fruits, seeds, flowers and leaves.

74

INVESTIGATION #6
Super Plant

Name _____

WORKSHEET #4



INVESTIGATION #7
Gardening Know-How

RATIONALE

Today many people are developing their own gardens. They use these as flower beds in the landscaping of their home or raising food to supplement store-bought food. Many times it is cheaper to raise food in the garden than to buy it at the store. This investigation will give you some helpful hints on the correct way to care for your garden.

TERMINAL OBJECTIVE

Students will demonstrate the proper planting and gardening techniques while growing a garden at school.

INSTRUCTIONAL OBJECTIVE #I

Given pictures of four types of gardens, the student will identify them as being indoor, vegetable, flower or a terrarium.

Suggested Activities:

1. Take a camera and go around the neighborhood and take pictures of various gardens.
2. Take garden magazines and cut out pictures of various gardens and categorize them.
3. On *Worksheet #1*, identify each plant and tell if it would go in a flower garden, vegetable garden or terrarium.

INSTRUCTIONAL OBJECTIVE #II

In a role playing situation, the student will develop a vegetable garden.

Suggested Activities:

1. Take three seed packages and read the directions. State how they are different and alike.
2. View pictures on preparing a garden for planting. Attempt to sequence the procedure in the order in which each job should be done. *Use Worksheet #2.*
3. Observe the pictures of a yard full of weeds and one weed-free. Tell how the two differ. *Use Worksheet #3.*
4. Study six pictures dealing with gardening. Tell if you see anything wrong in any of them. *Use Worksheet #4.*
5. Observe pictures of plants given fertilizer and one that isn't. List three ways fertilizer improves the plant.
6. On *Worksheet #5*, "Taking Care of a Garden", observe and discuss the job that each person is doing.
7. Visit a garden supply store and locate the section for fertilizers. List three fertilizers used in a garden.
8. Locate three stores you would go to for gardening supplies in the Yellow Pages.
9. Observe pictures of gardens and discuss reasons why the garden was planned like it was.
10. Sprout roots of a begonia, geranium, and coleus by putting the stem in a glass of water until roots form.
11. Have the students number the pictures found on *Worksheet #6* in correct order and have them tell a story about the picture.

INVESTIGATION #7
Plants

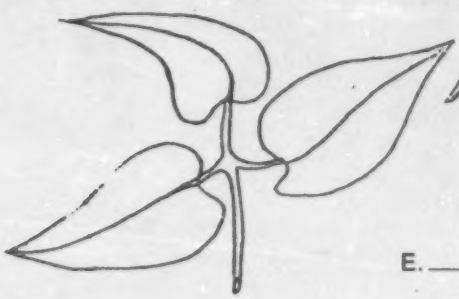
Name _____

WORKSHEET #1

A. _____

B. _____

C. _____



D. _____

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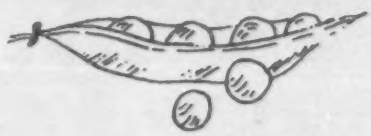

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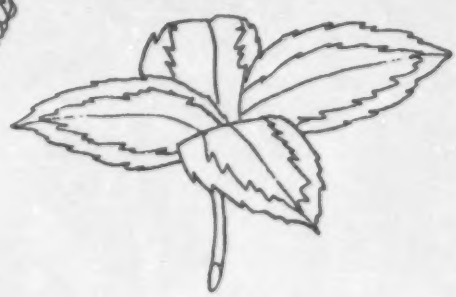


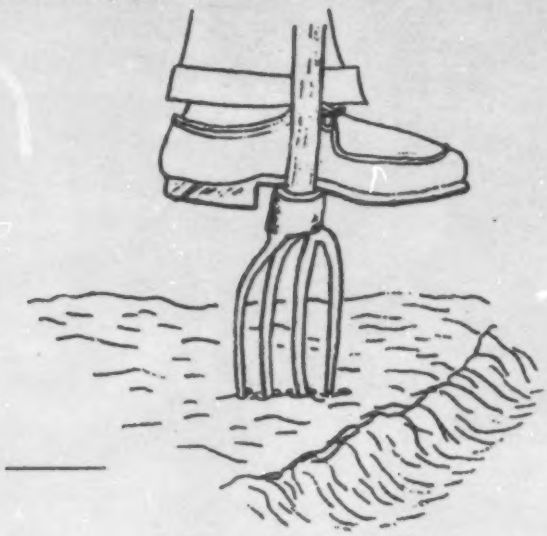
I. _____

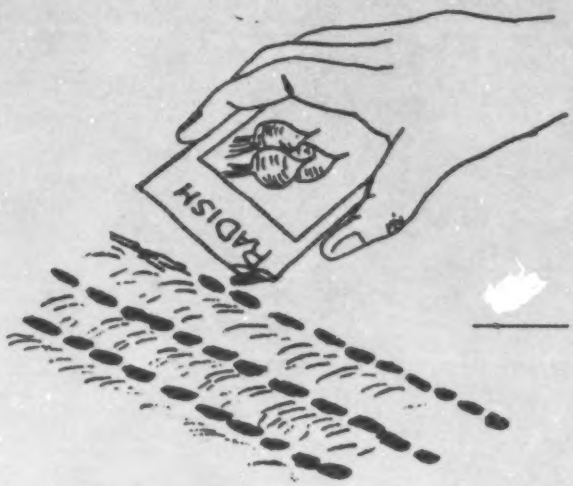
INVESTIGATION #7
GARDENING KNOW-HOW

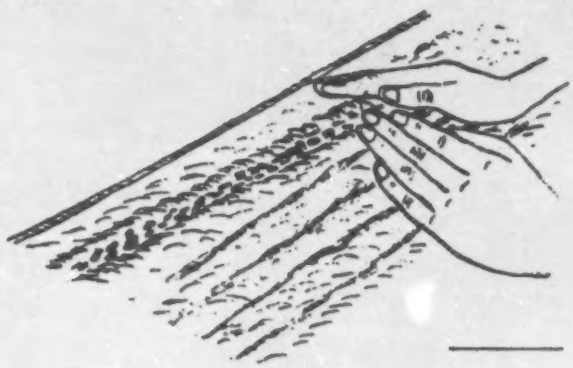
Name _____

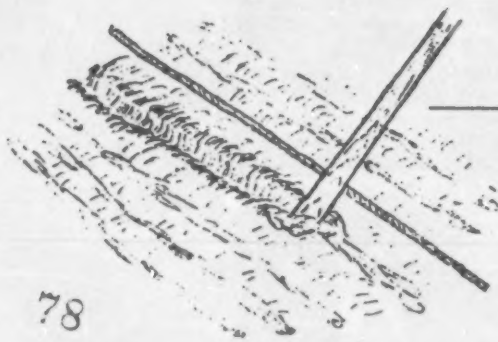
WORKSHEET #2

Instructions:
Number the steps in planting a garden in the correct order.







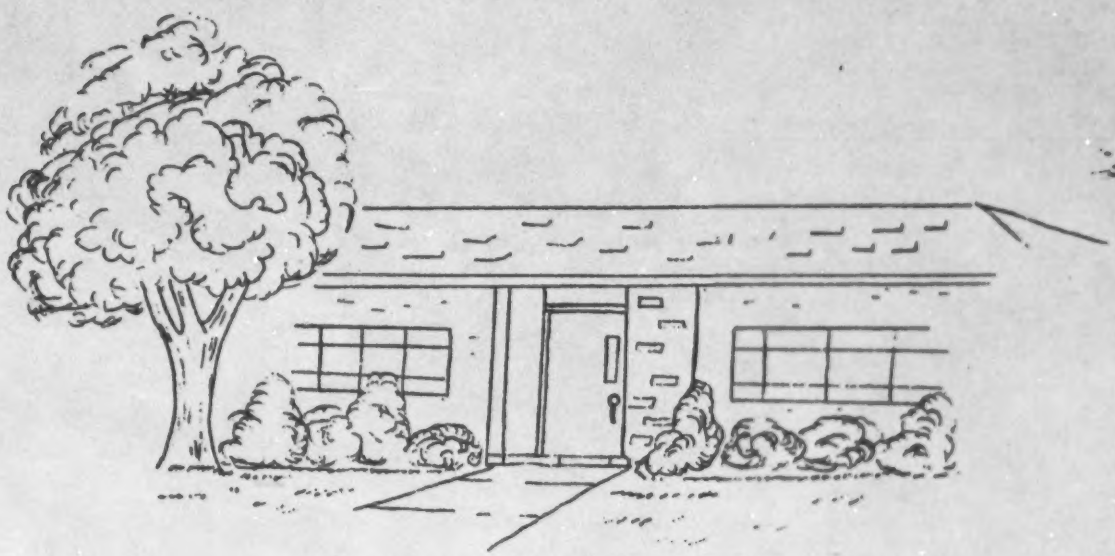


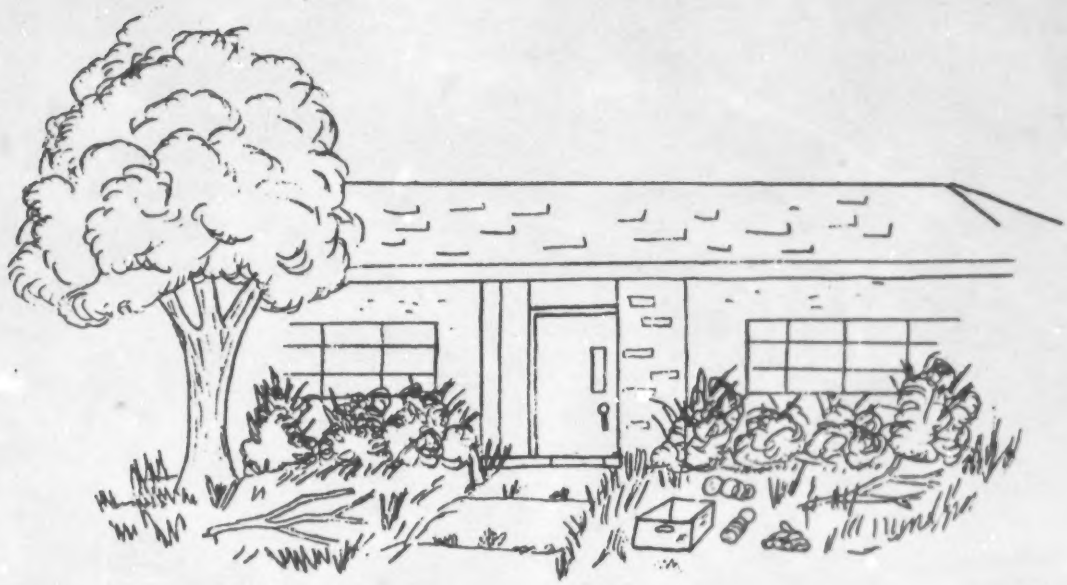
78

INVESTIGATION #7
Yards

Name _____

WORKSHEET #3





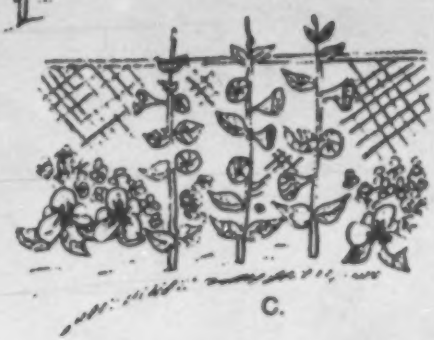
INVESTIGATION #7
Gardens

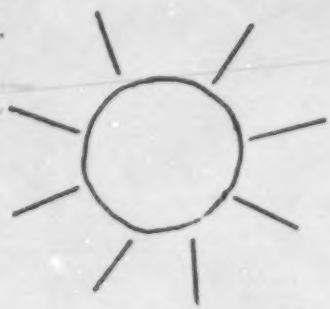
Name _____

WORKSHEET #4

A.

B.


C.



D.

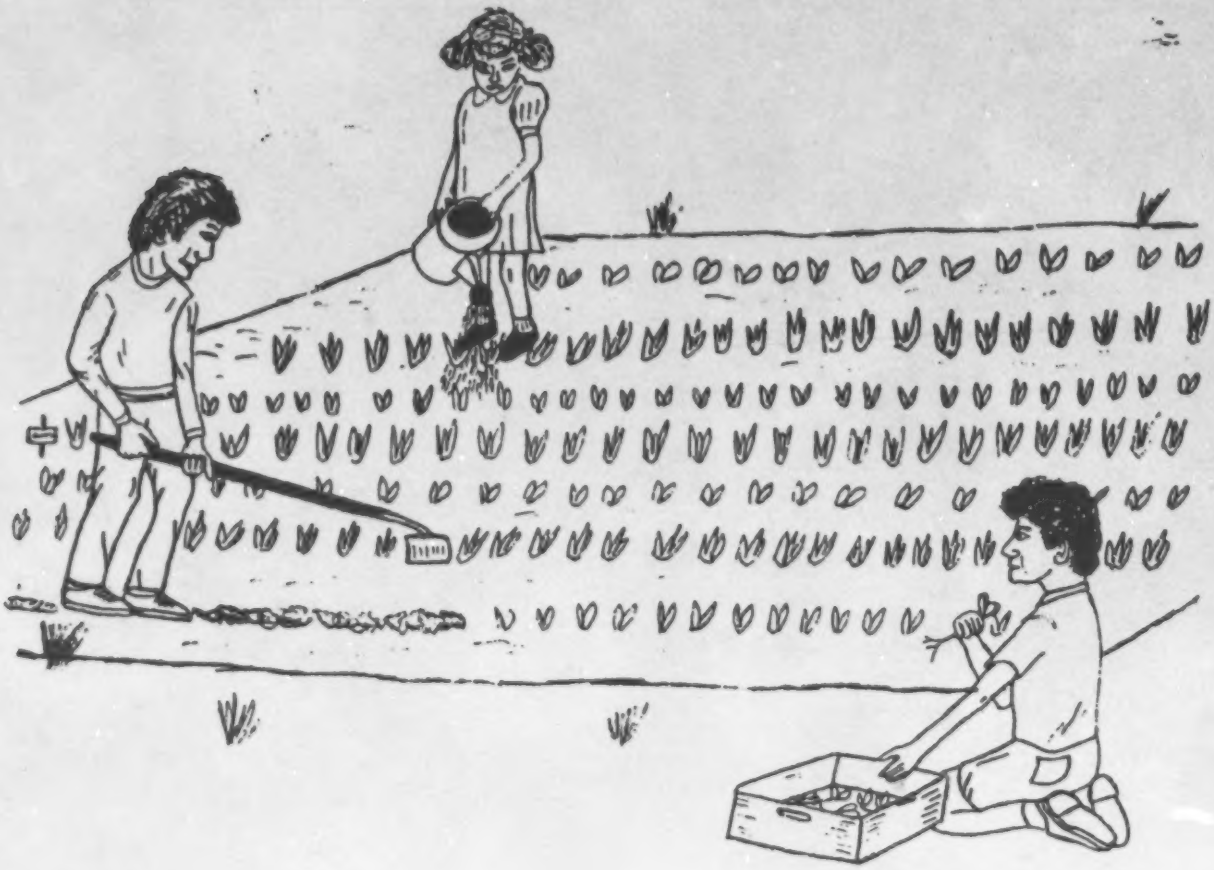
E.

F.

INVESTIGATION #7
Taking Care of a Garden

Name _____

WORKSHEET #5

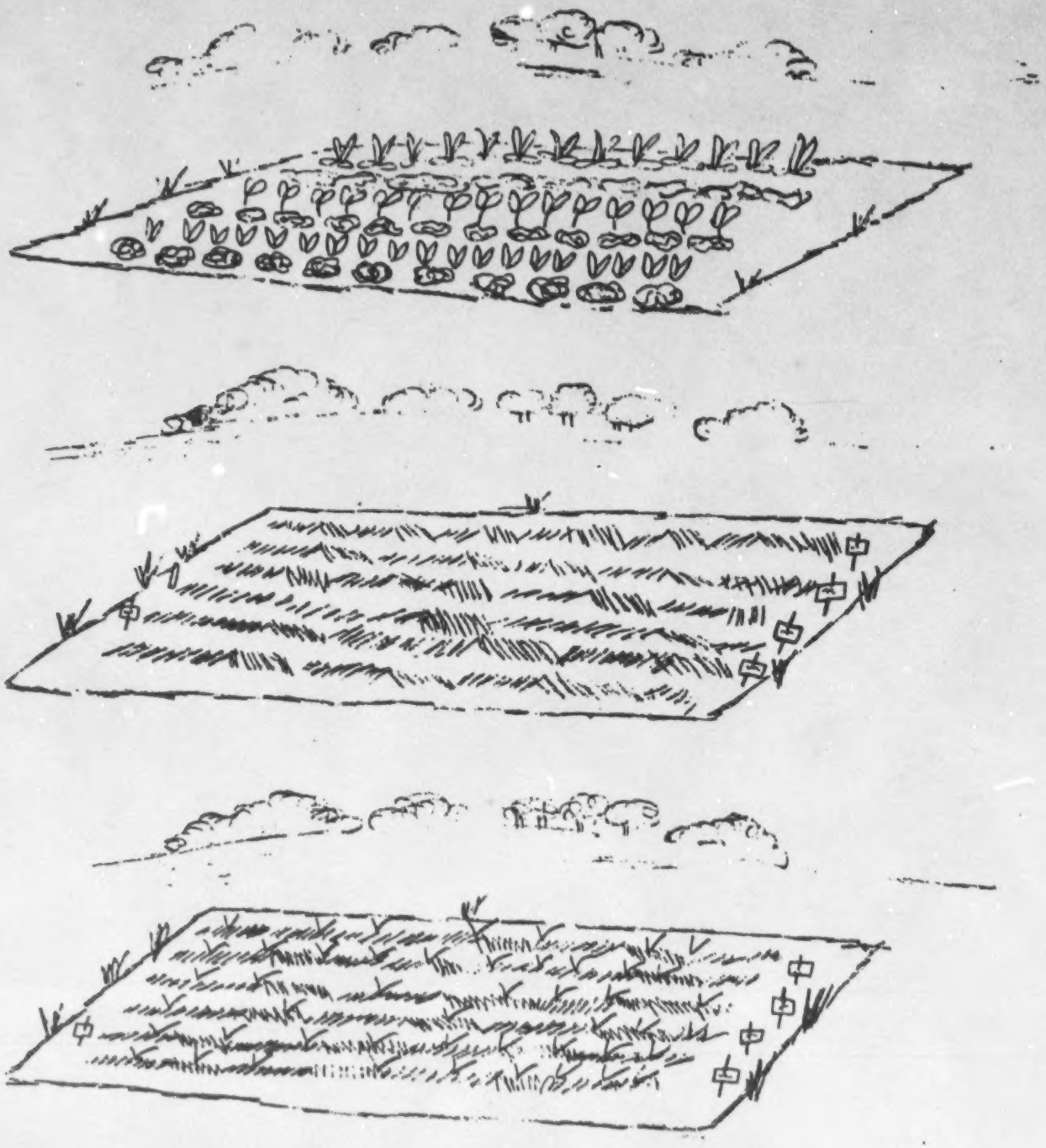


INVESTIGATION #7
GARDENING KNOW-HOW

Name _____

WORKSHEET #6

Instructions:
Number the three pictures in correct order.



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INVESTIGATION #8
Value of Gardening

RATIONALE

Gardening today is a popular pastime. A garden can put food on the table and add beauty to the home and community. Gardening experience and knowledge, can lead to a rewarding job. Students must be made aware of this part of the world around them.

TERMINAL OBJECTIVE

Students will learn the necessity of gardens in todays environment, including the production of food, beautification of the home and community and the opportunity for jobs.

INSTRUCTIONAL OBJECTIVE #I

The student will list ten food products that are grown in a vegetable garden.

Suggested Activities:

1. Visit a food store and observe the fresh vegetables and fruits that were raised in a garden.
2. While in the produce department, point to three vegetables and identify them.
3. Visit a large truck farm and observe the food grown there.
4. Study a variety of labels from canned foods and list the ingredients grown in the garden.
5. Classify pictures of twenty foods as roots, leaves, stem, seeds and fruit.
6. List five plants you have eaten this week.
7. Match ten pictures of food with the plant from which it was grown.
8. Purchase vegetables at the store, return to school and cook them.
9. Sample fruit with eyes closed and identify each one you eat.
10. Given various problems, compare items purchased in the store to those raised in the garden.

INSTRUCTIONAL OBJECTIVE #II

Indicate ways gardens can beautify the home and community.

Suggested Activities:

1. Following a discussion on the enjoyment of having cut flowers or plants in the classroom, students should bring a bouquet of flowers or a plant to school.
2. Using magazines, cut out pictures of rooms that have plants or flower arrangements. Create a collage on the bulletin board.
3. Given a variety of flowers, plants and greens, make an attractive floral arrangement.
4. Given flip cards of various scenes, tell how plants play a role in them.
5. After a field trip to a park, list five things you found beautiful and three things that needed improvement.
6. While on the field trip, take pictures of beautiful and ugly scenes.
7. Using magazines, cut out pictures of houses and their exteriors. Evaluate the pictures.
8. Using pictures of poorly kept homes, state five ways to improve the appearance.
9. Shown a picture of an attractive home, give two reasons why it is attractive.
10. Given a magazine, cut out five objects which would help make a home attractive.
11. While on a field trip, point out homes which have an attractive appearance and indicate things which make it attractive.
12. Shown a picture of an unlandscaped home, name three ways to make the yard look prettier.
13. Given a picture of a well-kept house, list five things which must be done to keep it looking attractive.
14. Make a chart listing the chores that must be performed in the spring and summer to maintain an attractive lawn.
15. Invite a nurseryman or landscaper to speak to the class.
16. In a role playing situation, you are on a committee to beautify the exterior of our school and were given $300.00 to do so, how would you landscape the school grounds?
17. Draw a diagram of a vegetable garden and a flower garden.

INSTRUCTIONAL OBJECTIVE #III

Indicate jobs in the community which deal with environmental tasks.

Suggested Activities:

1. In a list of twelve occupations, underline the seven dealing with living things. *Worksheet #1.*
2. Given two lists, correctly match an occupation with a plant or animal. *Worksheet #2.*
3. Using a local telephone directory, check the Yellow Pages and list (in writing) the names, addresses and telephone numbers of five businesses in the community that deal with plant or plant products.
4. Classify ten jobs according to seasonal or permanent employment.

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5. After viewing slides of various jobs dealing with living things, state which jobs are available in area of environmental work.
6. Given five job ads, state the jobs that deal with the environment.
7. Visit a nursery and observe the jobs that are available there.
8. Given the occupational category, landscape helper, name three duties of that job.
9. View a filmstrip on farming and afterwards list the jobs that the farmer is responsible for.
10. Given a list of job tasks of a gardener's helper, correctly match each job with the correct picture.
11. Using *Worksheet #3,* have the students identify the different garden tools and tell about their use.
12. Go out and apply for a job in environmental work.

INVESTIGATION #8
JOBS RELATED TO LIVING THINGS

Name _____

WORKSHEET #1

A. (Item #1) A list of jobs is given below. Underline the jobs that directly deal with *living things.*

1. electrician
2. assembly line worker
3. veterinarian
4. landscaper
5. house painter
6. cook
7. greenhouse worker
8. mechanic
9. game warden
10. secretary
11. dishwasher
12. farmer
13. nurseryman
14. florist
15. construction worker

B. (Item #2) Match the two lists. A plant or animal should be matched with the correct occupation. There is only one correct answer for each.

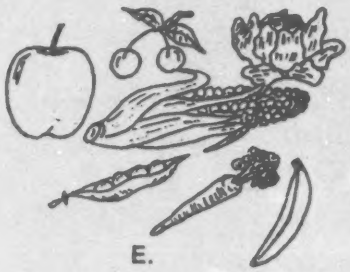
_____ 1. florist	a. deer
_____ 2. farmer	b. cows
_____ 3. veterinarian	c. trees
_____ 4. landscaper	d. perch
_____ 5. fisherman	e. roses
_____ 6. game warden	f. dogs

INVESTIGATION #8
VALUE OF GARDENING—Occupational Match

Name _____

WORKSHEET #2

A.



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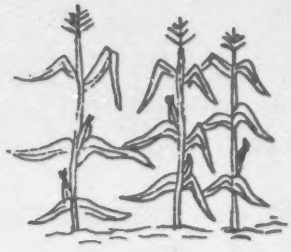

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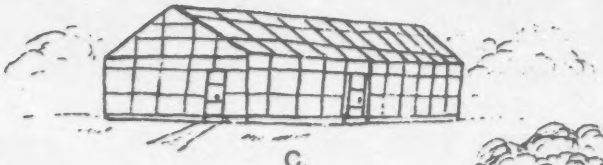

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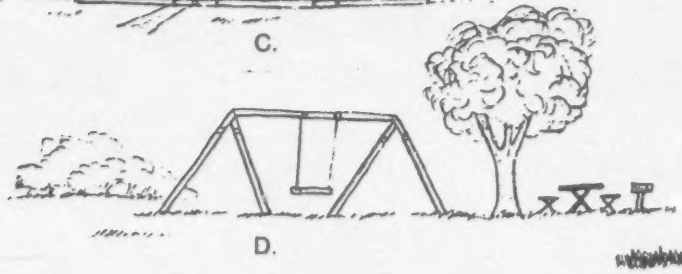

D.

H.

Instructions:

Match the above pictures with the correct occupation.

1. Veterinarian
2. Farmer
3. Landscaper
4. Supermarket
5. Florist
6. City Park Dept.
7. Nursery/Greenhouse
8. Gardener

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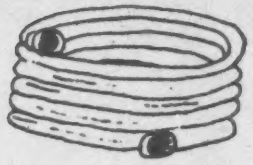
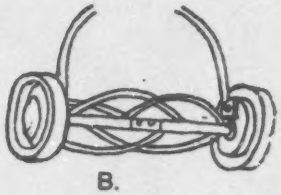
INVESTIGATION #8
Garden Tools

Name _____

WORKSHEET #3



A.



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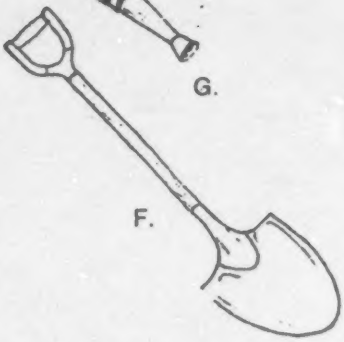

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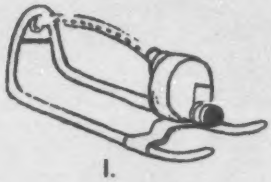
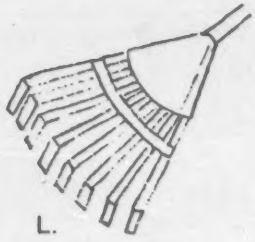


I.

J.

K.



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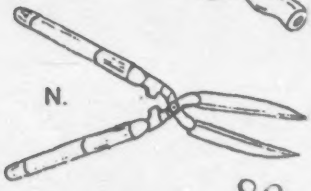

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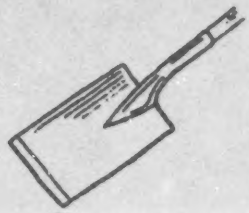

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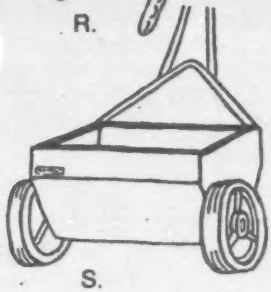

S.

T.

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INVESTIGATION #9
Wildflowers

RATIONALE

Students should develop an awareness and appreciation of the beauty found in nature. Learning to recognize a few common Ohio wildflowers should increase such awareness and appreciation.

TERMINAL OBJECTIVE

The student will become more knowledgeable in the out-of-doors as evidenced by his ability to identify the more common wildflowers of Ohio.

INTRODUCTION

Have dried flower arrangements on display in the classroom several days previous to the lesson to arouse interest.

BACKGROUND INFORMATION

A *wildflower* may be defined as any plant which grows without aid of cultivation. Wildflowers live in all areas as far North as the Arctic or South in the Tropics.

Spring Beauties This flower is found in the open woods. It has a delicate pink to white flower veined with deeper pink. It only remains open to bright light and grows to twelve inches high. These plants have starchy bulbs which the Indians use to eat. They bloom in early spring.

Adderstongues This flower belongs to the lily family and blooms early in Spring. It has a delicate small, lily-like flower in yellow, violet or white, and grows in the moist woodlands.

Violets This is a low leafy plant with a pretty delicate flower ranging in color from white to blue to very deep purple. Not all violets have the typical heart-shaped leaf, some have deeply indented narrow leaves. Violets grow in the woodlands and are found in many states. They have a very nice fragrance and make a lovely bouquet.

Trillium As their name implies, these flowers are constructed in threes: three leaflets and three-petals. The petals range in color from deep purple-red through pink to pure white. The flowers ripen into reddish or purple berries. It belongs to the lily family and blooms about the second week in May.

Toothworts These slender plants thrive in moist woods. It has a tall smooth stem 6-15 inches high, bear-toothed leaves and a small four-petaled flower — white or pinkish in color. The root tastes like watercress. It belongs to the mustard family and blooms in the late spring.

Wild Geranium This is a tall slender plant, twenty inches high, with finely cut leaves. The flowers are five petaled: lavender-pink and white. It blooms in spring and early summer. It belongs to the geranium family.

Mayapple This flower is found in great abundance at the Outdoor Education Center. It has large umbrella-like leaves. It has a white flower and blooms in late spring. It is a member of the barberry family. The edible lemon-yellow fruit has a strawberry flavor, but the root, stem and leaves are *poisonous*.

Jack-in-the-Pulpit This is an American wildflower that grows in moist woodlands and thickets. The loss of wooded areas in Rocky River has resulted in a scarsity of this attractive flower. This flower has been well-named. The part that looks like the preacher is the slender stalk called the spadix. The tiny greenish-yellow flowers grow in a club-shaped spike on the upper part of this stalk. The "Pulpit" is a leaflike growth which encloses the spadix like a trumpet. The oddly shaped flowers bloom from April to June, and then produce clusters of smooth, red berries. The plant grows from a turnip-like root filled with starchy juice. The juice sometimes used in homemade cough medicine, has a stinging, bitter taste. The root is tasteless when boiled, but it is a nourishing food. It is also called Indian turnip.

False Solomon-Seal The small starry white flowers of this plant form a cluster at the end of the stem. The flowers ripen into small red or bronze berries. It blooms in the late spring and early summer; and belongs to the lily family.

Queen-Anne's-Lace This flower is also called wild carrot, for its leaf resembles that of a carrot leaf. It is a member of the parsley family. This large white lacy flower is really a cluster of tiny white flowers. It grows in great quantity in Rocky River and at the Outdoor Education Center. It blooms in summer and fall. Many people dry it and use it in lovely bouquets.

Goldenrod This flower is easy to identify for it is the tall yellow flower we see growing along roadsides or in open field in summer and fall. The tiny flowers are clustered along the stem. Some people are sensitive to its pollen. There are over 125 species of goldenrod that grow in this country.

Chicory Chicory came to us from Europe. It is now found throughout most of the United States growing in pastures and along roadsides. At the Rocky River Outdoor Education Center it can be found along the sewer easement next to Devon Hill Drive.

The light blue flowers are very sensitive to light and open and close with an increase or decrease of the amount of light available. The roots are often roasted and ground to make a substitute for coffee.

INSTRUCTIONAL OBJECTIVE #1

Students will be able to identify ten of the following wildflowers: violets, Mayapple, Jack-in-the-pulpit, Queen-Anne's-lace, goldenrod, Solomon-seal, adderstongue, wild geranium, spring beauty, toothwort, trillium and chicory.

Suggested Activities:

1. Help the student identify the above wildflowers from a number of pictures of flowering plants.
2. Using *Worksheet #1 Series*, color and label each wildflower. Use Zim and Martin, *Flowers;* Golden Press as a resource book for students.
3. Using flashcards of wildflowers, identify each by name.
4. Show slides of wildflowers and have students identify each correctly. Audio-tutorial slide-tape programs are available through the Project ENRICH Office.
5. Take a trip to the Rocky River Outdoor Education Center. Each student can take along the *Worksheet #1 Series* and look for the flower depicted in the drawing. All of these *wildflowers can be found in the woods next to Rocky River City Hall.* Note that some are spring and some are summer and fall flowers. Spring flowers are generally in bloom throughout May.
6. Using *Worksheet #2,* have students match the pictures with the name of the flower. *This worksheet can be used as a post test if needed.*
7. Complete *Worksheet #3* and cross out the plants that do not belong in the list.
8. Have a class discussion on the necessity of wildflowers. Students should be able to give examples of how wildflowers are useful.
9. If students have cameras, ask them to take pictures of wildflowers.
10. Invite a florist to the class to show how dried flowers can be used in floral arrangements.
11. Using food coloring in water, have the students dye the Queen-Anne's-lace different colors. This can be done by immersing a fresh cut stem in colored water. The colored water will then travel up the stem and the pigments will be deposited in the blossom of the plant.
12. Have the students collect a quantity of Queen-Anne's-lace and make a Queen-Anne's-lace angel. Follow the directions on *Worksheet #4.*
13. Use *Worksheet #5* and put a *yes* under wildflowers and a *no* under plants that are not wildflowers.

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INVESTIGATION #9
WILDFLOWERS—Spring

Name _____

WORKSHEET #1-A

Color and name each flower.

1. _____

2. _____

3. _____

4. _____

INVESTIGATION #9
WILDFLOWERS—Spring

Name _____

WORKSHEET #1-B

Color and name each flower.

5. _____

6. _____

90

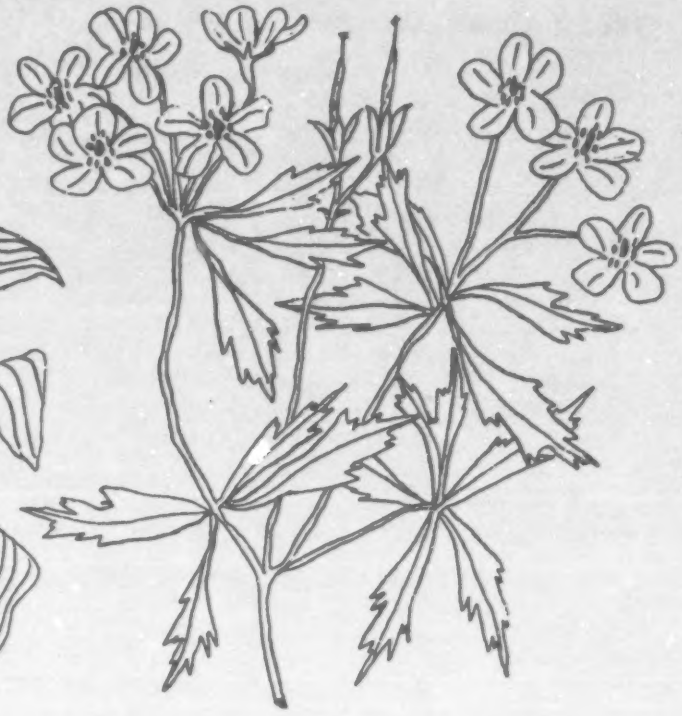
INVESTIGATION #9
WILDFLOWERS—Spring

Name _____

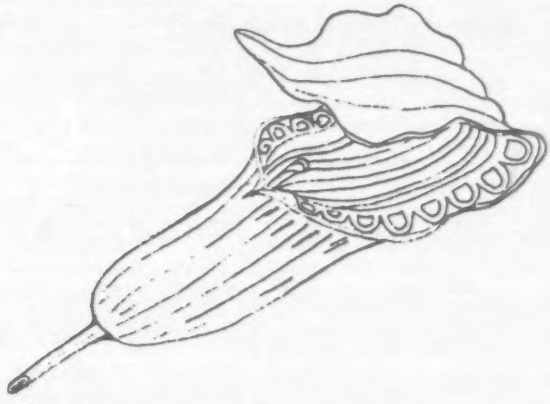
WORKSHEET #1-C

Color and name each flower.

7. _____



8. _____



9. _____

INVESTIGATION #9
WILDFLOWERS—Fall

Name _____

WORKSHEET #1-D

Color and name this flower.

10. _____

92

INVESTIGATION #9
WILDFLOWERS—Spring

Name _____

WORKSHEET #1-E

Color and name each flower.

11. _____

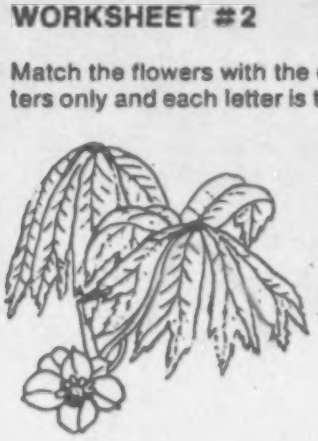
12. _____

INVESTIGATION #9
WILDFLOWERS

Name _____

WORKSHEET #2

Match the flowers with the correct name. Use letters only and each letter is to be used only once.



1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

a. Goldenrod
b. Mayapple
c. Solomon-seal
d. Queen-Anne's-lace
e. Jack-in-the-pulpit
f. Violet
g. Adderstongue
h. Wild geranium
i. Spring beauty
j. Toothwort
k. Trillium

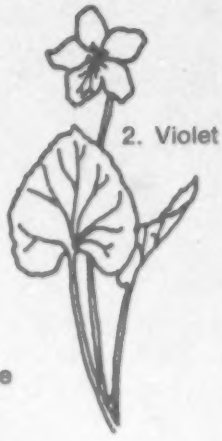
INVESTIGATION #9
WILDFLOWERS

Name _____

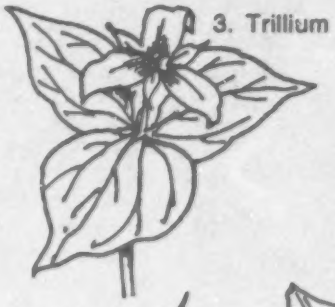
WORKSHEET #3

A. Cross out the names of the flowers that are not wildflowers you have studied

1. Adderstongue



2. Violet

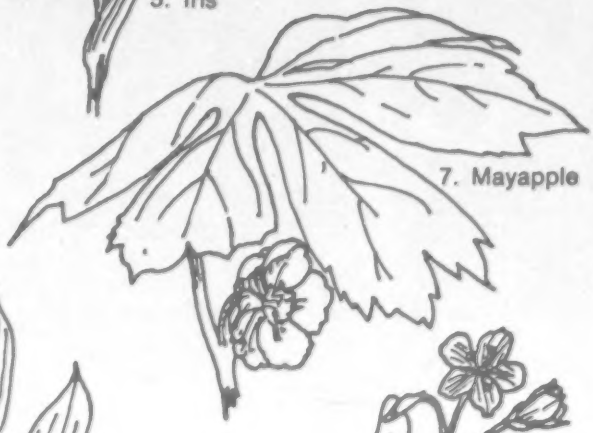


3. Trillium

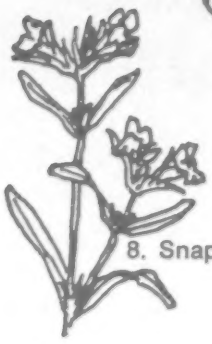
4. Gladiolus

5. Iris

6. Toothwort



7. Mayapple



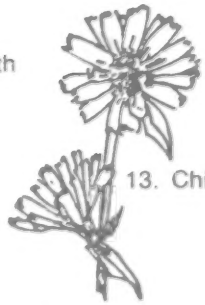
8. Snapdragon

9. Solomon seal

10. Goldenrod

11. Spring beauty

12. Grape hyacinth



13. Chicory

14. Marigold

B. Where would you normally find the flowers you crossed off of this list.

_____

_____

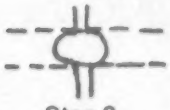
INVESTIGATION #9
WILDFLOWERS—Queen-Anne's Lace Angel

Name _____

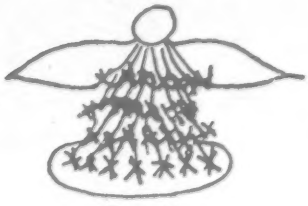
WORKSHEET #4

This charming Christmas Angel is made of natural dried materials that can easily be collected locally from late summer to fall. You will need to get: four to five Queen-Anne's lace flowers that have gone to seed in a ¾ open position, a gall formed by an insect on a goldenrod stem, and seed pods of the milkweed. In addition, you will need: a circle of cardboard 3½ inches in diameter, Elmer's glue, pipe cleaners, florist's wire, floral tape, a piece of gold braid, gold spray paint and glitter.

Step 1.


Step 3.

Step 5.


Step 7.

Step 1. Attach your largest Queen-Anne's lace bloom to the circle of cardboard.

Step 2. Attach wires to two milkweed pod halves with floral tape.

Step 3. Cut stem above and below the goldenrod gall.

Step 4. Attach wings to gall by pushing wires through the hole at the base. Glue into position, if necessary.

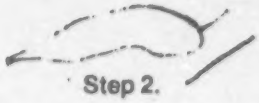
Step 5. Also push and glue the stem of the smallest Queen-Anne's lace into the hole at the base of the goldenrod gall.

Step 6. Glue 2–3 more Queen-Anne's lace seed heads on top of the one attached to the cardboard base. Let dry.

Step 7. Glue on top the Queen-Anne's lace goldenrod gall and wings.

Step 8. Twist a pipe cleaner around the neck for arms and fashion a small crown from the gold braid. Glue this onto the head.

Step 9. Generously spray the figure with gold paint and dust the skirt with glitter while the paint is still wet.


Step 2.

Step 4.

Step 6.

Step 8.

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INVESTIGATION #9
WILDFLOWERS

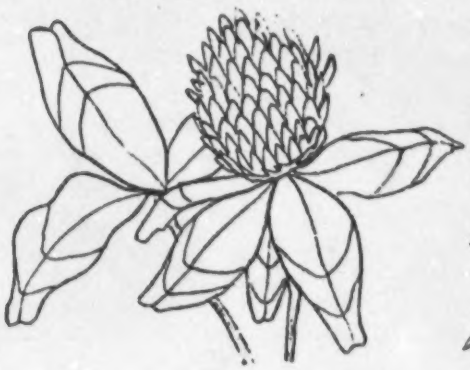
Name _____

WORKSHEET #5

1. _____

3. _____

2. _____

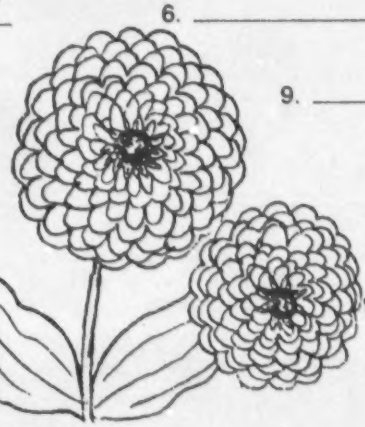


4. _____

5. _____

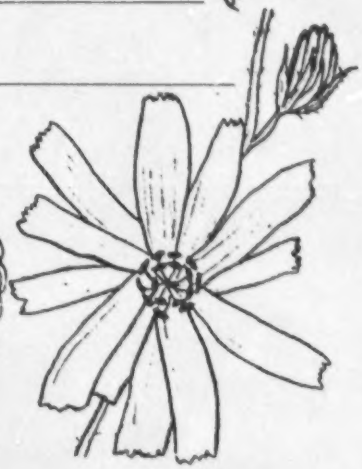
6. _____

7. _____



8. _____

9. _____



INVESTIGATION #10
Harvesting Wild Fruits

RATIONALE

There are many wild fruits that can be harvested and used as food. Among these are wild crabapples, wild grape, blackberries, raspberries, elderberries, black walnuts, hickory nuts and others. An experience at harvesting and eating wild fruits is not only enjoyable, but it is also an important part of the study of our nation's heritage.

TERMINAL OBJECTIVE

The student shall understand how a wild fruit was collected and preserved for winter use by early settlers and how such fruits can be used today.

INSTRUCTIONAL OBJECTIVE #I

The class shall collect, preserve and taste wild black walnuts.

Suggested Activities:

1. Find a black walnut tree in your school area and get permission to collect some of the nuts in late fall. Follow these instructions for cleaning and preserving.
   a) Students should search for illustrations of the black walnut tree so that they can identify it.
   b) Collect the nuts in late fall. Be certain to leave a supply for the squirrels.
   c) Husk the fruit while in the field. Use a hammer or rock to break the outer green covering. *Make certain that the students wear rubber gloves or old leather gloves while cleaning the nuts.* The hands will become badly stained if not protected. This stain will not harm the hands in any way but will make them unattractive for quite some time.

      Save some of the husks for making fabric dye in the classroom.
   d) Place the cleaned nuts in a basket and spray them with water. Do this outdoors. The spraying will wash away the remaining stain and leave the fruit as clean as possible.
   e) Spread out the nuts on a flat surface in the classroom until the surface of each fruit is dry.
   f) Do not use the fruit for a week or two. This will permit the meats to dry and have a firmer texture.
2. You are now ready to taste your harvest.

INSTRUCTIONAL OBJECTIVE #II

The students shall make black walnut fudge.

Suggested Activities:

1. Make as many batches of fudge needed for your class. Follow these instructions or use your own recipe.
   a) Needed
      - 4 cups sugar
      - 1 — 14½ ounce can (1⅔ cups) evaporated milk
      - 1 cup butter or margarine
      - 1 — 12 ounce package (2 cups) semi-sweet chocolate pieces
      - 1 pint marshmallow creme
      - 1 teaspoon vanilla
      - 1 cup broken black walnuts
   b) Butter the sides of a heavy 3 — quart saucepan. In it combine the sugar, milk, and butter. Cook over a medium heat to the soft ball stage (236°), stir frequently.
   c) Remove from heat; add the chocolate, marshmallow creme, vanilla and nuts. Beat until the chocolate is melted and blended.
   d) Pour into a buttered 9" x 9" x 2" pan. Score in squares while warm.
   e) Makes 3 dozen 1½ inch pieces.

INSTRUCTIONAL OBJECTIVE #III

Students will dye a fabric using walnut husks that were removed from the nuts when they were collected.

Suggested Activities:

1. Dye white cotton materials using walnut husks. The following directions are only suggestions. You may want the students to experiment with the procedure and see if it can be improved.
   a) Ask the students to bring in a clean, old shirt, bedsheet, or other white cotton material. Do not use synthetic fabrics.
   b) Boil a quantity of the outer shell (husks) of the black walnut fruit in sufficient water for dyeing the cloth. You may have to experiment to see just how concentrated the dye should be.
   c) Soak each piece of the fabric until it is as dark as desired.
   d) Hang and dry.
2. Attempt to find ways in which designs can be included in the dyeing process. Melted paraffin wax sometimes is used for this purpose.

INVESTIGATION #11
Trees of Ohio

RATIONALE

Trees provide an excellent opportunity for outdoor ecology activities. Skills, such as observing, inferring, measuring and communicating, can all be developed using trees as a vehicle for such skill development. In addition to being of natural interest to young people, trees have the unique advantages of standard characteristics, ease of identification, seasonal changes and fixed locations. A field trip to a wooded area can be planned well in advance with assurances that field trip ojectives can be achieved with a minimum of searching for desired specimens.

TERMINAL OBJECTIVE

The student shall use the process of skills of observing, inferring and communicating in the study of deciduous and evergreen trees and be able to identify families and species of trees that are characteristic of our region.

BACKGROUND INFORMATION

The following information relates to trees you will study in this investigation. Hopefully, this information will provide readily accessible facts that you can use in your instruction.

American Beech This is a tall spreading tree of the shady forest and has a smooth gray bark. It has a small simple leaf with neat straight veins. At the end of each vein is a tooth. The leaves turn brown in the fall. The big roots of a beech tree spread out flat along the ground and often have moss or ferns growing around them. Beech nuts are small and have prickly husks that crack open. These nuts are eaten by small animals and birds.

American Elm This tree grows to be very large and it spreads it branches like a big umbrella. It makes an excellent shade tree, but a disease called the Dutch elm disease is slowly killing off these wonderful trees. The elm leaf is lopsided; one side is longer than the other. It has a saw-toothed edge; and turns brown and yellow in the fall. The elm has a small brownish flower that blooms in early spring, and flat round winged seeds.

American Linden This tree is also called the basswood tree. The linden does not stand alone in the woods. It almost always has a young one sprouting at its base. The leaves are heart-shaped and lopsided with a saw-toothed edge. The flowers are small, but the bees always find them. In June there may be so many bees around this tree, that it sounds as though it was humming. The honey is dark and good.

Cucumber Tree This is a member of the magnolia family and grows tall to over 100 feet. It gets its name from the fact that its lumpy fruit in the green stage looks something like a cucumber. It is a fine shade tree.

Gray Birch This tree grows in sunny places and is easy to identify by its white bark. In spring many long yellow catkins dangle from the birch, shaking their pollen on the wind. The gray birch has a triangle shaped leaf with a rough saw-toothed edge. The fruit which looks like a cone is a stack of flat oval seeds that fall apart in winter.

Oak The oak is a strong, sturdy tree that grows slowly, and the wind does not bend it. It is a tall tree of the shady forest and is often found on hillsides and slopes. The oak leaf is generally lobed and changes color three times a year: it is green in summer, red in fall, and brown in the winter. There are many kinds of oaks; all have acorns.

Pin Oak An oak of medium size that is found in lowlands and in moist woods; its upper branches grow up, and the lower branches bend downward. It has a simple deeply-lobed leaf with a point at the end of each lobe. It has a small, squat acorn.

Tulip Tree This tree is also called yellow poplar or tulip poplar. It is one of the tallest and handsomest trees of the forest. It grows to over 100 feet tall. It has a large greenish-yellow flower; the leaves are the shape of a tulip. Its seeds are eaten by squirrels and songbirds. Its fine wood is used in furniture. It is a member of the magnolia family.

White Ash A tall shade tree with long droopy leaves with short stemmed leaflets. The compound leaves grow opposite one another along the branchlets. Its purple flowers grow in tight clusters close to the twig. It flowers in late spring and has fruit in late fall. The fruit has narrow flat wings with a seed at one end, very similar to the maple seed. It provides a hard durable wood, good for furniture, tennis rackets, and baseball bats.

Sassafras Tree This is a tree that tastes good and smells lemony. The best taste is in the root. The pioneers boiled the root and made a tasty tea. Oil from the sassafras tree is used in soaps and rubbing lotions. The sassafras tree has four different shapes of leaves. The leaves look like mittens. This tree is beautiful in the fall. Its leaves turn orange, red and yellow. It can grow in poor soil, where other trees cannot.

Shagbark Hickory This tree is easy to recognize for it has the shaggiest of all barks. The tree grows slowly and has tough wood. It is used for handles on axes, hammers, and it makes fine

skies. The leaves are large, smooth on top —hairy on the bottom. There are five leaflets. The three on the tip are much bigger. (See sketches on *Worksheet = 2-K).* In the fall the leaves turn rusty and yellow. The nuts it bears are hard to crack, but delicious.

Scotch Pine This is a common evergreen and many are found in our Metropolitan parks. The leaves are in bundles of two and about five centimeters in length. The cones are re-curved toward the trunk of the tree. The bark of the tree near the top branches resembles a scotch plaid. Much of the bark is light orange in color.

Staghorn Sumac This is a short tree that is easy to recognize for at the end of its branches are thick bunches of hairy red berries. If you pick a berry and lay it on your tongue, it will taste sour. The leaves on the leaflet are long and feather-shaped with a saw-toothed edge. At certain times of the year, a stag deer has a velvet cover on his horns. A similar velvet is found on the end of a staghorn sumac stem; perhaps this is why the tree was given its name.

Black Locust This is a tall, graceful tree that smells heavenly in late May, when its flowers are in bloom. Its wood is hard and farmers use it for fence posts because it does not readily decay. This tree is not good for climbing because it is covered with thorns and its branches break easily. The leaf of the black locust tree is compound with each leaflet having a well-rounded end.

White Oak A tall, broad tree of the dry or moist woods, it has a simple leaf with deep-rounded lobes. The bark is usually light and smooth. The acorn cap is bowl-shaped, covering ⅓ of the acorn. The acorn is sweet and matures in one year.

Willow The willow tree grows beside a lake, a riverbank, or in moist areas, as in the Outdoor Education Center. It helps to prevent erosion. It is easy to recognize for its long narrow leaves. The wind shapes a willow tree; the tree bends in the direction the wind is blowing. Some willows have branches that droop and they are called "weeping willows". The wood of this tree is used for fuel, charcoal, posts, and in medicine.

Wild Black Cherry One of our finest and most valuable forest trees, its hard wood is of high quality for use in furniture. It also bears a delicious fruit, which is eaten by animals, birds, and man. The smooth brownish bark on young trees becomes cracked into rough plates as the tree matures. The leaves are thick, narrow, tapering and shiny green.

TEACHING PROCEDURE

Although the materials in this investigation can be used in any forest area, one of the most convenient locations for studying trees is the Rocky River Outdoor Education Center. A map of the center is included in this investigation along with a numbered key which will help you identify trees along the hiking trail.

Copies of the worksheets can be duplicated and given to students to use when in the field. A comparison of the drawings to the actual tree should provide sufficient information for students to identify the species. If oral rather than written responses are desired, the worksheets can be mounted on hardstock and laminated for more efficient field use.

Students may collect leaves at the Rocky River Outdoor Education Center for the purposes of:

a) Pressing and mounting
b) Spatter paint outlines
c) Contact printing

A magazine can effectively be used as collecting equipment. Placing leaves between the pages is a good way to keep them in good condition until they can be properly pressed.

Please do not overlook the opportunity of permitting students to touch leaves and bark and describe texture. Snapping a twig and smelling the fragrance can also be interesting. While in the field, attempt to make the students aware of the shapes in nature and any changes that might be taking place.

INSTRUCTIONAL OBJECTIVE #I

Each student will be able to describe a leaf as alternate or opposite in arrangement, pinnately or palmately veined, pinnately or palmately compound, simple or compound, and rough textured or smooth.

Suggested Activities:

1. Prior to a field trip, study the general structure of a leaf. Use *Worksheet # 1 — A.*
2. Take a field trip on the school grounds and surrounding area. Using *Worksheets # 1 — A, ' — B, ' — C, ' — D and 1 — E,* Find trees that have leaves which are:
   a) Pinnately veined
   b) Palmately veined
   c) Lobed
   d) Not lobed
   e) Simple
   f) Compound
   g) Alternate
   h) Opposite

INSTRUCTIONAL OBJECTIVE #II

Each student will be able to identify ten trees common to our region of Ohio.

Suggested Activities:

1. Take a field trip to a wooded area. Using the *Worksheet # 2 Series,* have each student find

trees that match the drawings. Repeat this activity until the students can identify and name ten different trees. If you choose to use the Rocky River Outdoor Education Center, you will find that these trees are numbered for ease in identification. A map of the Outdoor Education Center and a numbered key are included in this investigation.

You may wish to use trained volunteers for such field trips. One volunteer for each group of four students is a good ratio. You may recruit volunteers and have them trained by the Project ENRICH staff or request that trained adults be supplied by the project ENRICH office.

2. While on the field trip, permit students to collect a leaf from each tree studied. These leaves can then be used to make spatter outlines or in making the photographic prints in Investigation #16.
3. The written material on each *Worksheet #2 Series* can be read by the student or can be used by the instructor as field information.

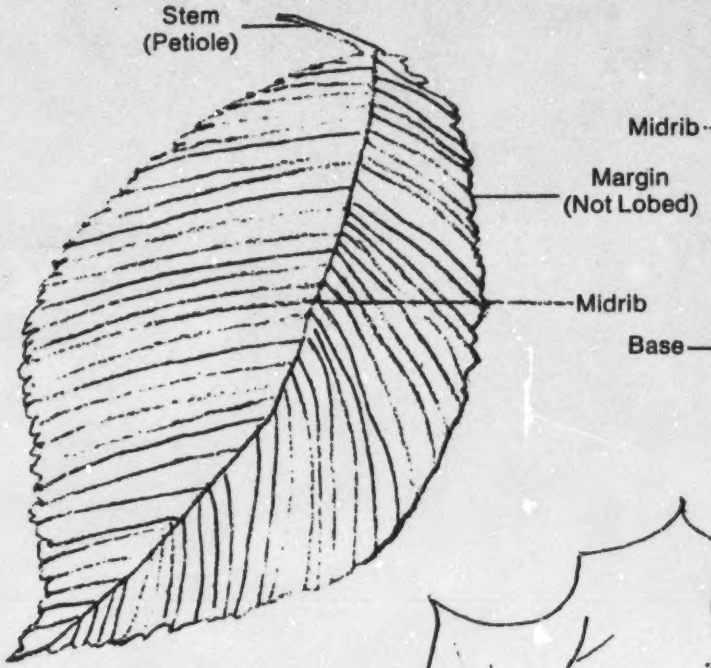
INVESTIGATION #11
Leaves

Name _____

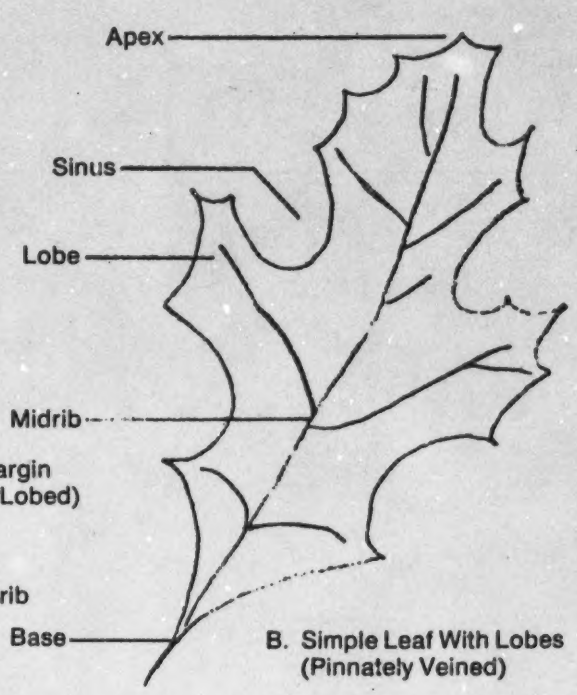
WORKSHEET #1-A

The drawings On this page have the parts of a leaf named. When studying trees, it helps to know these parts. By knowing the correct names, we can discuss the similarities and differences in leaves without becoming confused.

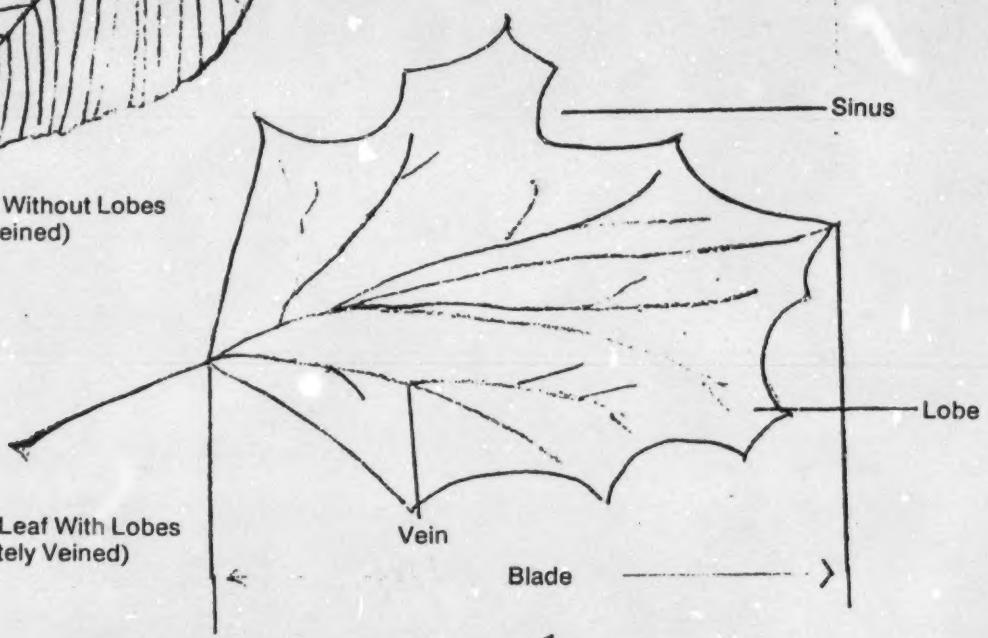
When in the field, try to find trees with leaves that are lobed. A lobed leaf has parts sticking out very similar to the lobe of your ear. A leaf with lobes also has sinuses; these are the places where the leaf margin turns inward toward the midrib.



A. Simple Leaf Without Lobes
(Pinnately Veined)



B. Simple Leaf With Lobes
(Pinnately Veined)



C. Simple Leaf With Lobes
(Palmately Veined)

102

INVESTIGATION #11
TREES OF OHIO—Leaves

Name _____

WORKSHEET #1-B

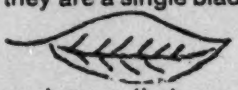
Circle the leaves that are lobed. Place an X in the leaves that are pinnately veined. A *pinnately veined leaf* is one that has a midrib from which all veins branch. *A palmately veined leaf* has all of the big veins fanning out from the base in much the same way your fingers come out from the palm of your hand.

INVESTIGATION #11
TREES OF OHIO--Leaves

Name _____

WORKSHEET #1-C

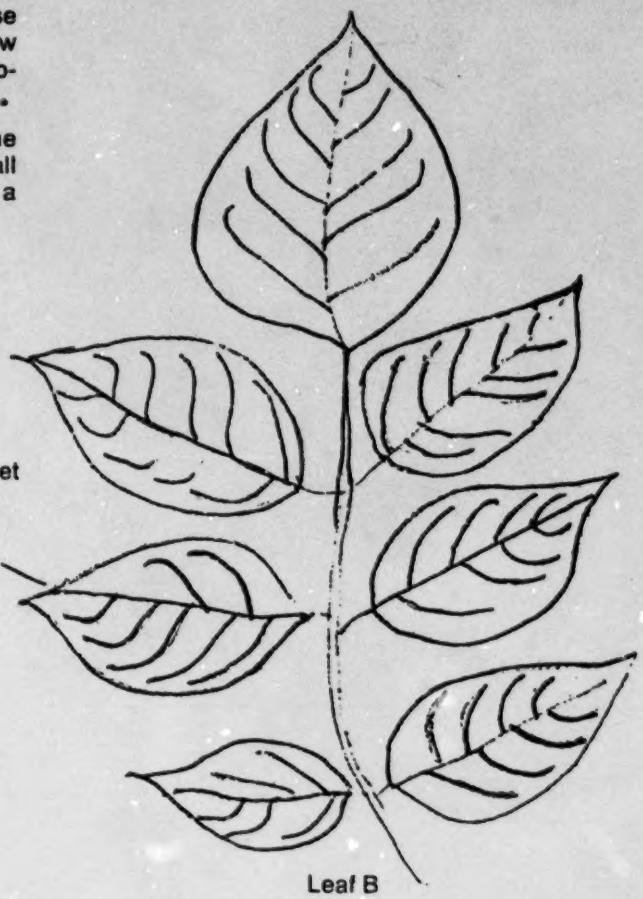
Most leaves are simple rather than compound. This means that they are a single blade like this.



Some trees have leaves that are compound. Compound leaves are really one leaf made up of a number of small leaves called leaflets. On this page, there are two compound leaves. These leaves are pinnately compound--notice how each leaflet branches off of the midrib and is opposite to another leaflet.

Another type of compound leaf is found in the buckeye and chestnut trees. The leaflets all come out of a center point and the leaf takes a form similar to this drawing.

Leaf A



Leaf B

How many leaflets are there on leaf A? _____

How many leaflets are there on leaf B? _____

104

INVESTIGATION #11
TREES OF OHIO—Leaves

Name _____

WORKSHEET #1-D

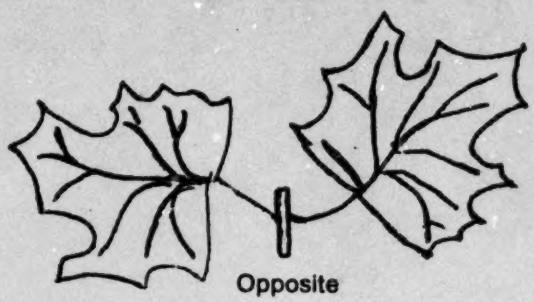
Color all compound leaves green.

INVESTIGATION #11
TREES OF OHIO—Leaves

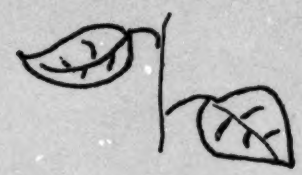
Name _____

WORKSHEET #1-E

On some trees, the leaves are scattered on the stem. We say they are alternate. On some trees, the leaves come off the stem directly across from each other. We say they are opposite. Examples of alternate and opposite leaves are shown below.



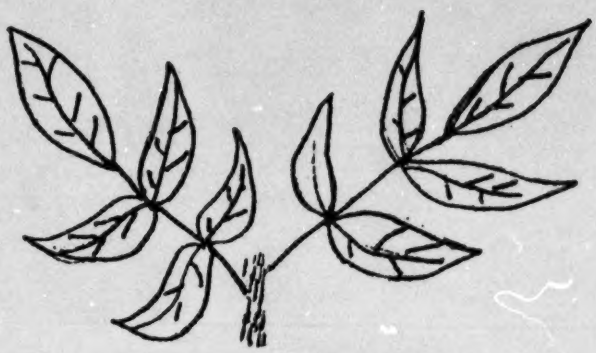
Opposite



Alternate

Write the word alternate or opposite under each of the following drawings.

A. _____



B. _____

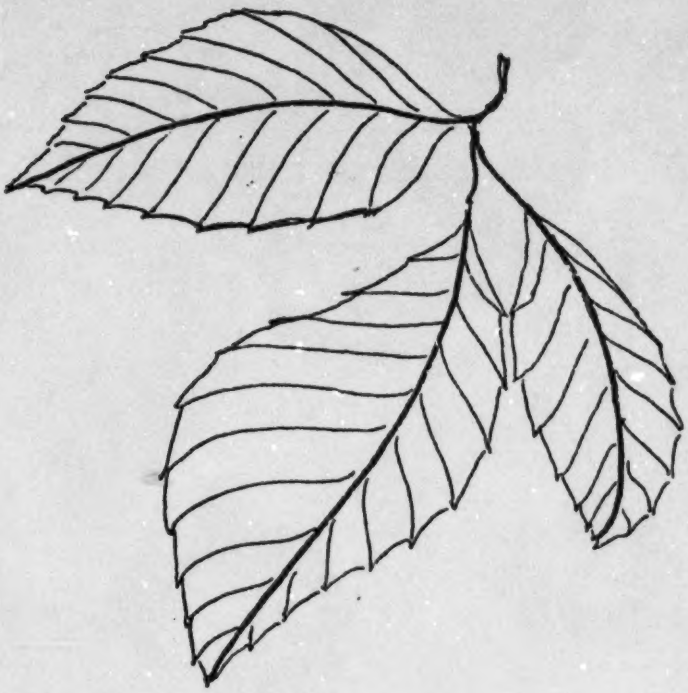
C. _____

D. _____

INVESTIGATION #11
TREES OF OHIO—American Beech

Name _____

WORKSHEET #2-A



American Beech

The American beech is one of the larger trees of the forest. Beech trees have such a thick growth of leaves that very little light can get through them. As a result, very few plants can grow under the tree's branches.

The beech nut is one of the favorite foods of squirrels, other small animals and some birds. Can you find a beech nut under the beech tree? Look carefully!

The smooth light gray bark of this tree makes it one of the easiest trees to identify at any time of the year.

Are the beech seeds spread by animals or wind?

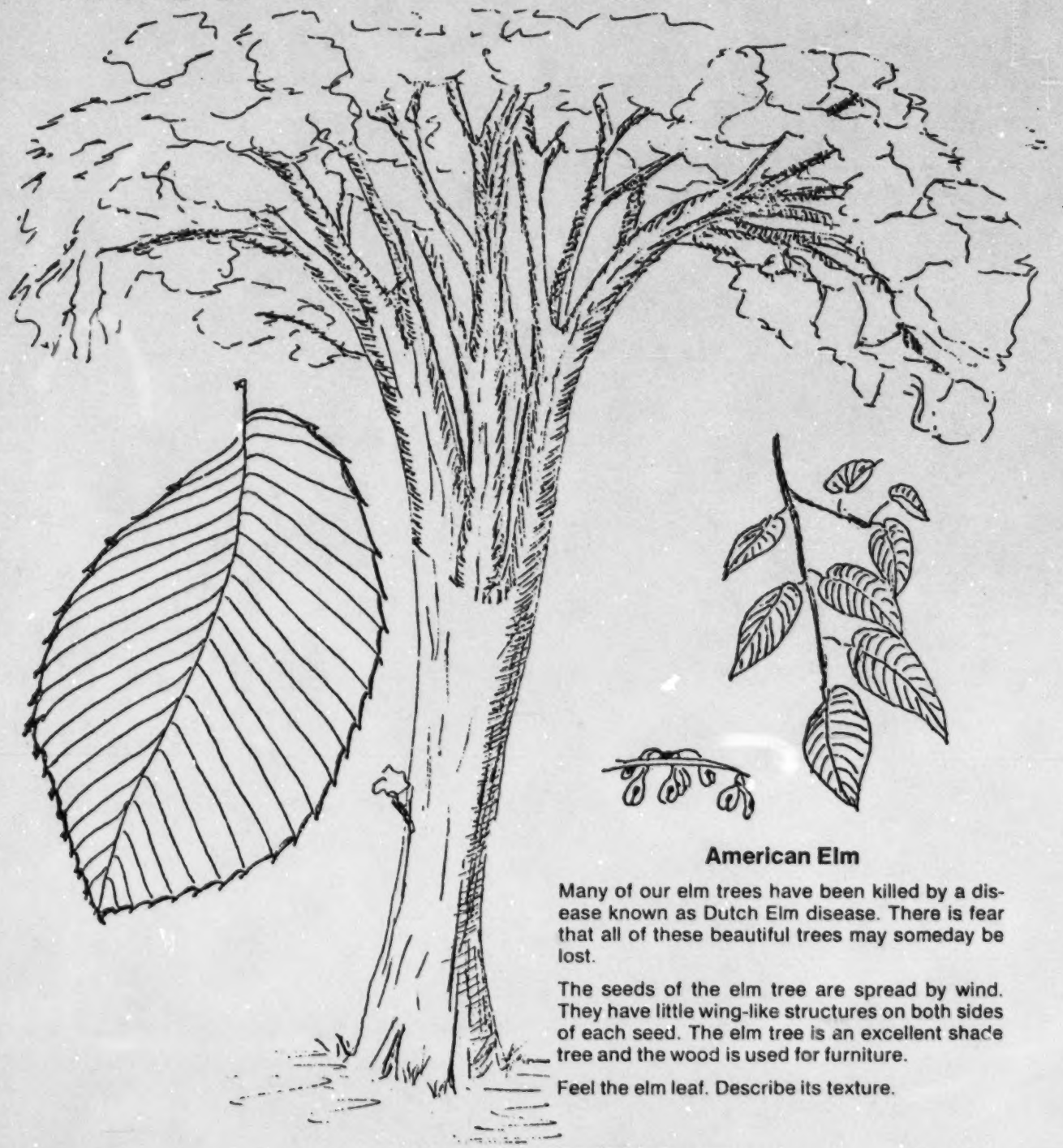
Are the leaves alternate or opposite?

Is the leaf lobed or not lobed?

INVESTIGATION #11
TREES OF OHIO—American Elm

Name _____

WORKSHEET #2-B



American Elm

Many of our elm trees have been killed by a disease known as Dutch Elm disease. There is fear that all of these beautiful trees may someday be lost.

The seeds of the elm tree are spread by wind. They have little wing-like structures on both sides of each seed. The elm tree is an excellent shade tree and the wood is used for furniture.

Feel the elm leaf. Describe its texture.

INVESTIGATION #11
TREES OF OHIO—American Linden

Name _____

WORKSHEET #2-C

American Linden

The leaf of the American linden tree is heart shaped. It has very heavy veins. Notice the unusual winged-like leaf from which the blossoms and seeds hang.

The blossoms of the tree are very fragrant. Bees can often be found collecting the nectar from the sweet flowers. It makes excellent honey.

Another name for the American linden is basswood. The fine grained wood is used to make cabinets and wooden kitchen ware.

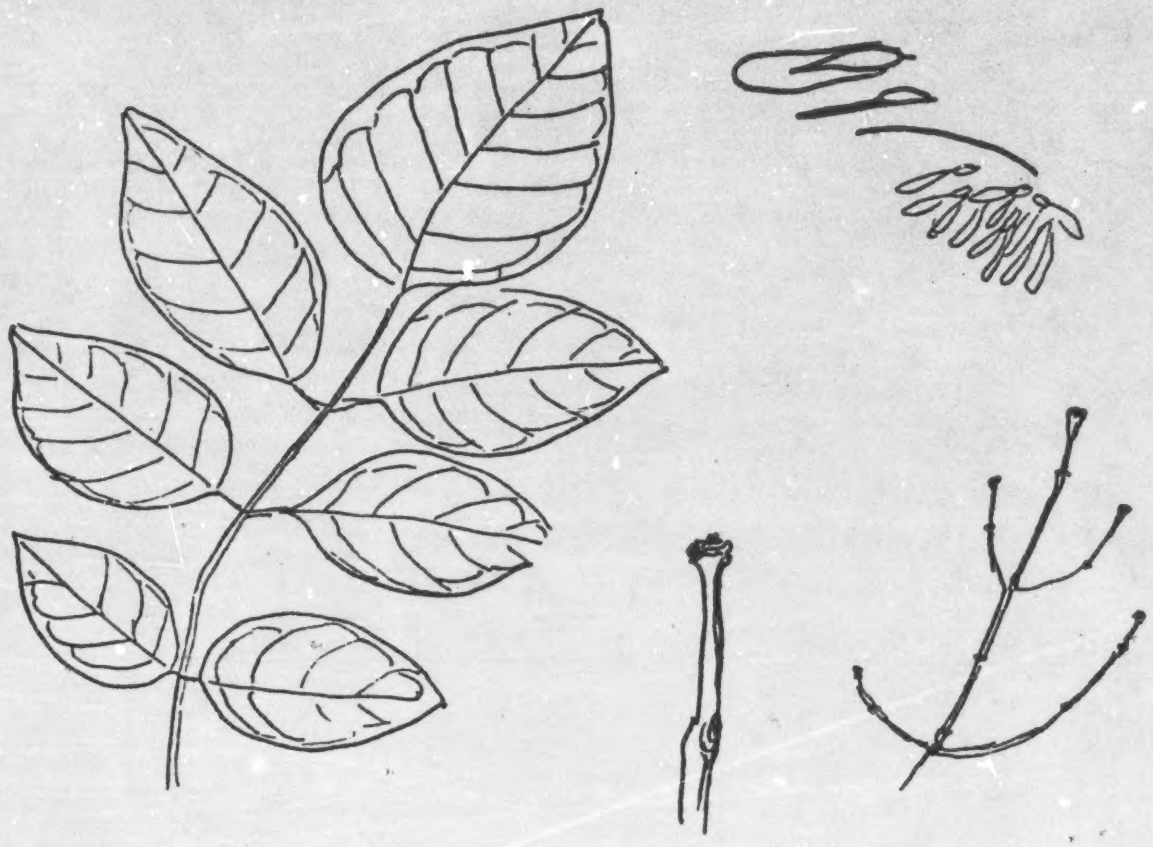
Be sure to try and find the blossoms and seeds.

They are interesting!

INVESTIGATION #11
TREES OF OHIO—Ash

Name _____

WORKSHEET #2-D



Ash

There are several different kinds of ash trees. The one shown in this drawing is a white ash. There are also red and black ash in our forests.

The seeds of the ash tree are winged. How do you suppose they are spread from place to place?

The ash wood is used in top quality baseball bats, tool handles and baskets. The winter twigs are shown above. Note how the branches are opposite each other. This means that the leaf arrangement is also opposite.

Is the ash leaf simple or compound?

Do the leaflets have lobes?

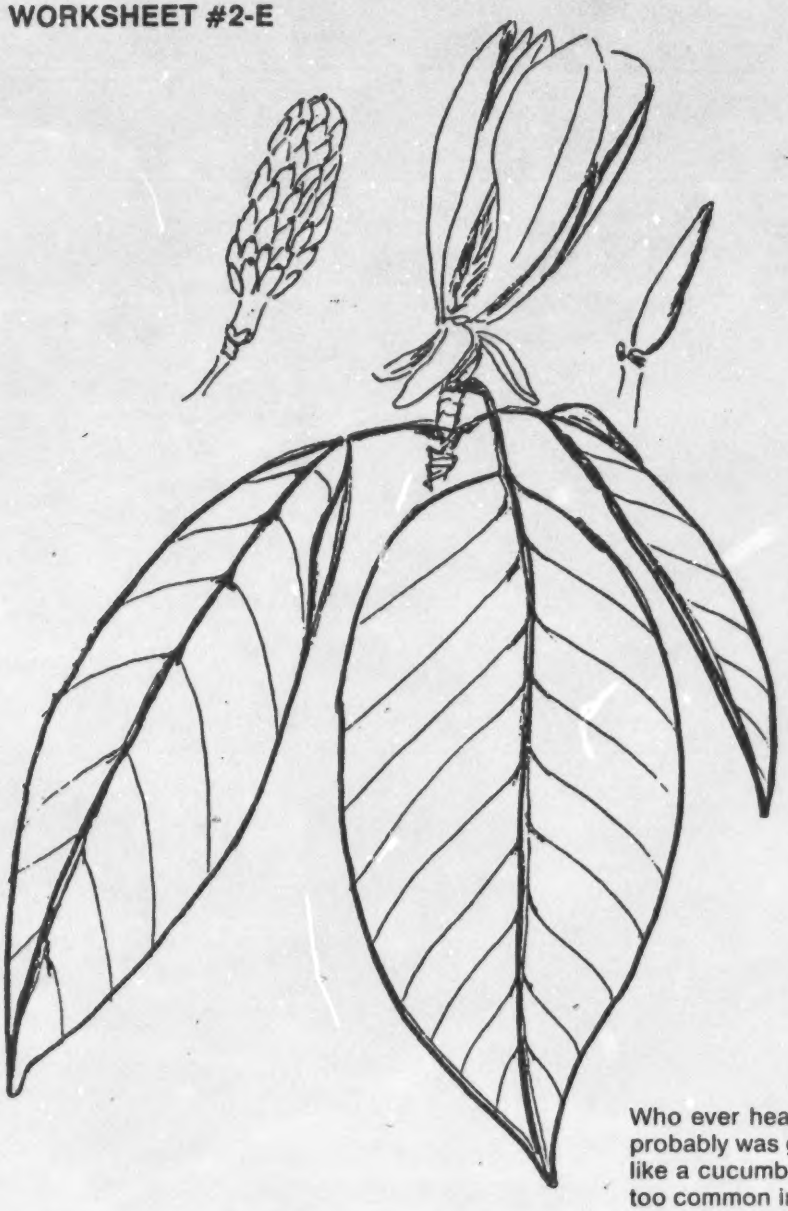
How many leaflets are there on a white ash leaf?

110

INVESTIGATION #11
TREES OF OHIO—Cucumber Tree

Name _____

WORKSHEET #2-E



Cucumber Tree

Who ever heard of a cucumber tree? The name probably was given because the fruit looks a little like a cucumber when it is green. The tree is not too common in our part of Ohio, but a number of them can be found at the Rocky River Outdoor Education Center. Actually, they are a member of the magnolia family. If you have a magnolia tree in your yard, you can tell that the leaves look very much like those above.

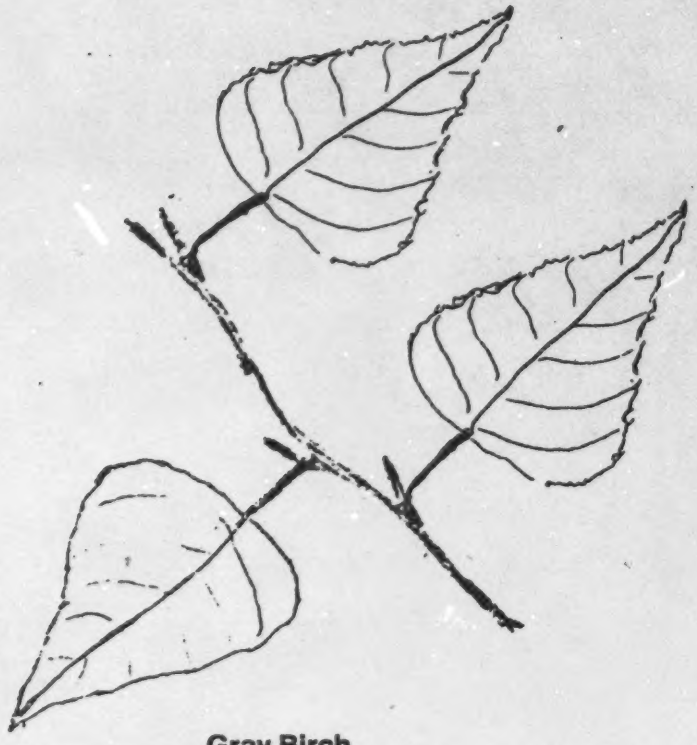
Is the leaf of the cucumber tree simple or compound?

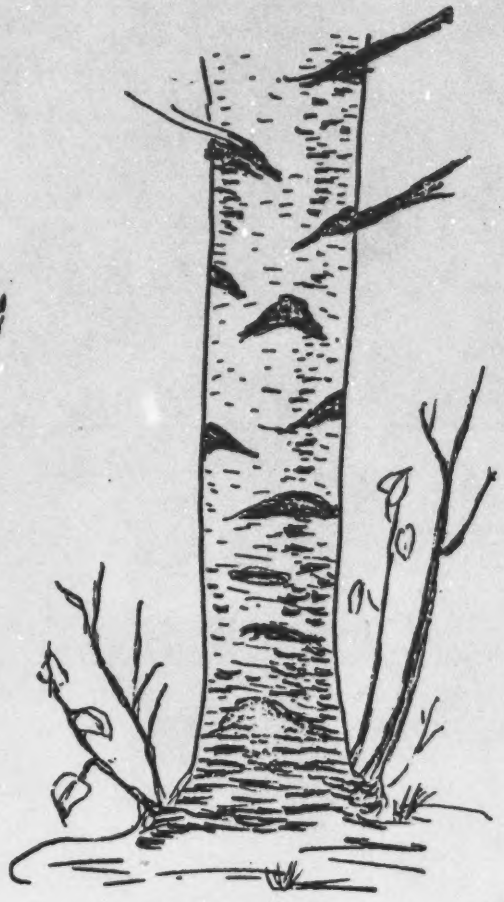
Does the leaf have lobes or does it lack lobes?

INVESTIGATION #11
TREES OF OHIO—Gray Birch

Name _____

WORKSHEET #2-F





Gray Birch

Perhaps one of the most attractive trees at the Rocky River Outdoor Education Center is the gray birch. Some people think that there are so many of these trees at the center because the seeds blew over from Lakewood Cemetery which is to the west. This tree normally does not grow well in this area and will die before it is thirty years old.

Indians made their canoes from a tree very similar to the gray birch. The bark can be easily removed from the tree and is easy to bend. You will have no trouble finding the gray birch. Just look for the tree with the white bark and a triangle leaf.

Are the leaves of the gray birch alternate or opposite?

Are the leaves simple or compound?

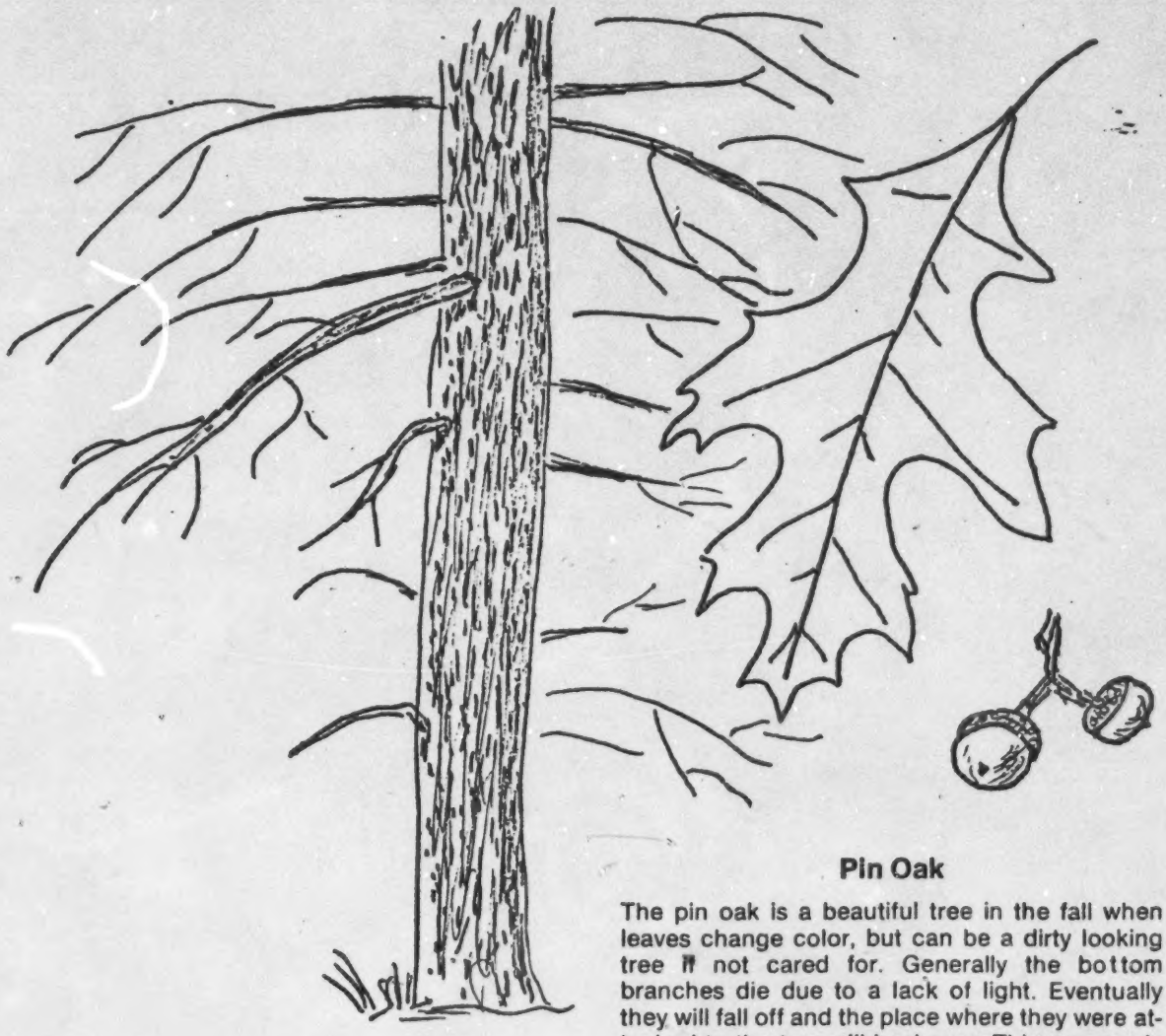
What shape is the leaf?

112

INVESTIGATION #11
TREES OF OHIO—Pin Oak

Name _____

WORKSHEET #2-G



Pin Oak

The pin oak is a beautiful tree in the fall when leaves change color, but can be a dirty looking tree if not cared for. Generally the bottom branches die due to a lack of light. Eventually they will fall off and the place where they were attached to the tree will heal over. This process is called self-pruning. You might remember that fruit trees are pruned by man in late winter.

When in the forest, look for the pin oak. You can generally find it easily by looking at the leaf and also noting the dead branches. The leaf and the dead branches are shown in the above drawing.

Are the leaves of the pin oak lobed?

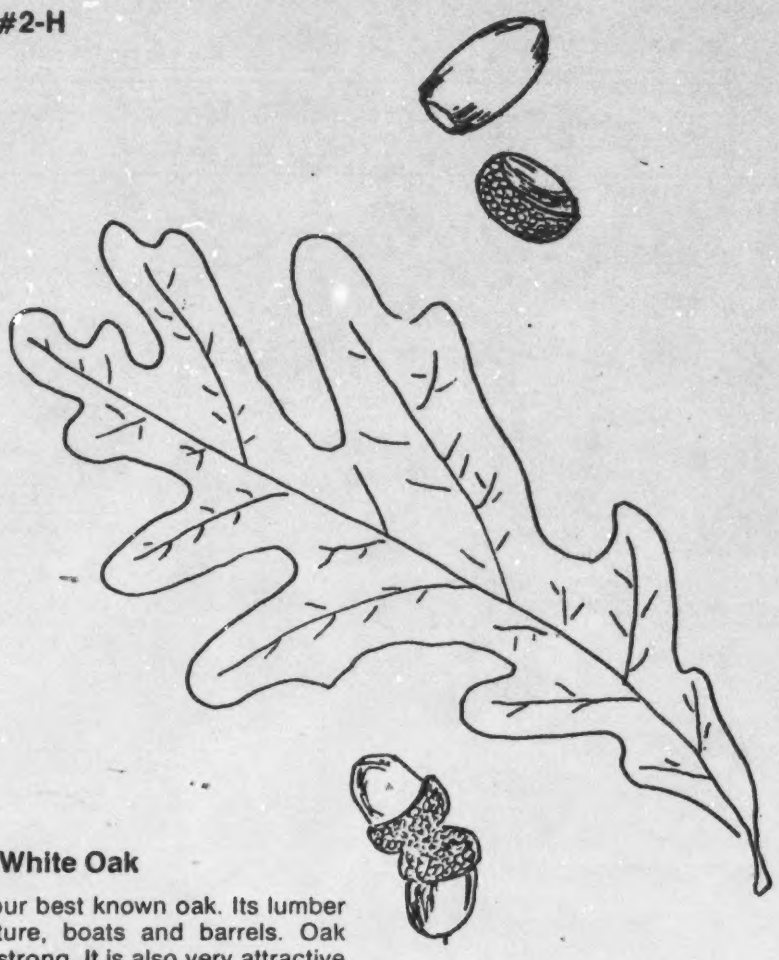
Look for the pin oak acorn. Take an acorn with you and compare it to acorns of other oak trees.

113

INVESTIGATION #11
TREES OF OHIO—White Oak

Name _____

WORKSHEET #2-H



White Oak

The white oak is our best known oak. Its lumber is used for furniture, boats and barrels. Oak wood is hard and strong. It is also very attractive when sanded and varnished. These are probably some of the reasons why many older homes have used oak as flooring. Does your home have an oak floor?

How many lobes are there on the white oak leaf?

Do all leaves have the same number of lobes?

Look for a white oak acron that has fallen to the ground. Take one with you and compare it to acorns from other oak trees.

114

INVESTIGATION #11
TREES OF OHIO—Maple

Name _____

WORKSHEET #2-I

Maple

Some of the common maples in our area are; the red maple, silver maple, Norway maple, and the sugar maple. It is hard to know one maple tree from another. If you pull a fresh leaf from a maple tree and a white sap comes out of the leaf stem, you can be sure that it is a Norway maple.

The maple tree is prized for its lumber, and is one of our finest shade trees. The seeds are in the shape of a wing. This unusual shape of the seeds is important. Can you think why?

Are the leaves of the maple pinnately or palmately veined?

Are the leaves alternate or opposite in arrangement?

Are the leaves simple or compound?

115

INVESTIGATION #11
TREES OF OHIO — Sassafras

Name _____

WORKSHEET #2-J

Sassafras

The sassafras tree is unusual because it has four different kinds of leaves. It has a leaf that looks like a three-fingered mitten, a leaf that looks like a right-hand mitten, a leaf that looks like a left-hand mitten and a leaf that is not lobed and doesn't resemble a mitten at all.

The twigs of the sassafras are bright green. Try breaking one and smell the fragrance. Does it smell lemony? Sassafras tea is made from the outer part of the root. The root is peeled of its outer covering and this peeled covering is dried than boiled in water. Packets of the dried sassafras root can be purchased in food stores. You may want to buy some and try old fashioned sassafras tea.

Try finding the four different leaves.

Be sure to snap a twig and smell the fragrance.

116

INVESTIGATION #11
TREES OF OHIO—Shagbark Hickory

Name _____

WORKSHEET #2-K

Shagbark Hickory

Hickory nuts are one of our tastiest natural foods. They can be collected in the fall and will last for a number of years if kept dry. They are great for making candy, but cracking and separating the nut meats from the shells is a job that calls for patience.

Hickory nuts are also one of the squirrel's favorites. Whenever there is a hickory tree branch loaded with nuts, you will almost always find a squirrel or two sitting on a branch having breakfast, lunch or late dinner.

People who hunt squirrels will sit quietly in the forest in the early morning hours and listen for the sound of bits of nuts and shells striking the ground. This is a sure sign that a squirrel is eating in a nearby tree.

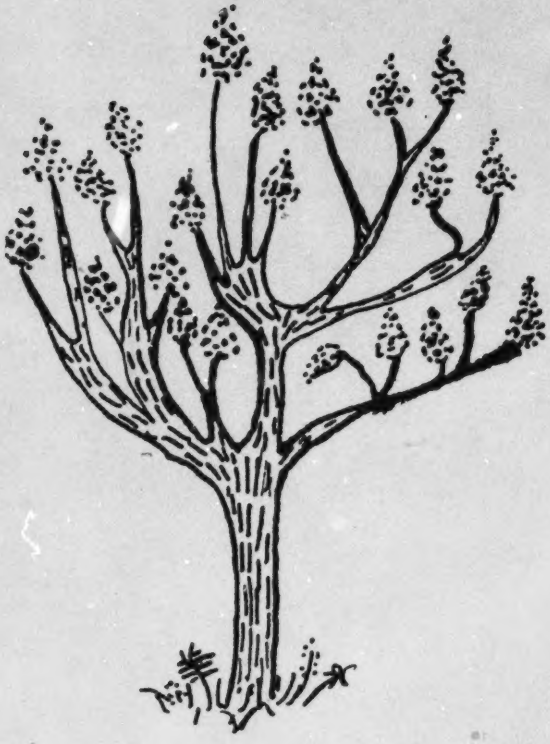
The shagbark hickory is easy to identify. It has a very shaggy bark that looks like it is peeling away from the tree trunk. Once you find one, try to find a hickory nut under it.

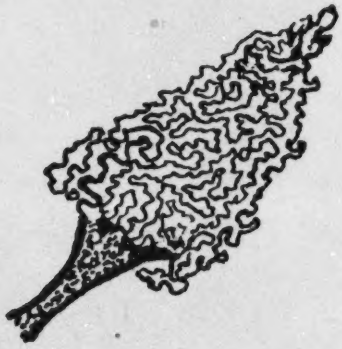
117

INVESTIGATION #11
TREES OF OHIO—Staghorn Sumac

Name _____

WORKSHEET #2-L





Staghorn Sumac

The staghorn sumac is so named because of its soft velvet-like branches. In the spring of the year, the stag deer has antlers that are covered with a velvet-like growth. This growth is very much like the velvet on the staghorn sumac.

There is some question as to whether the staghorn sumac is a tree or a shrub. It seldom grows very high. The leaves are compound and are brightly colored in the fall.

The staghorn sumac does not cause a rash as does the poison sumac. The poison sumac looks much different than the staghorn. It generally grows in or near marshes.

Be sure to feel the stem of the staghorn sumac. Describe its texture.

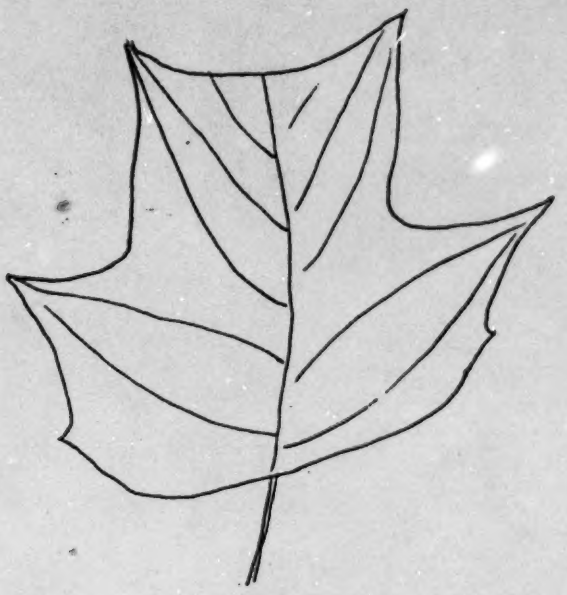
How many leaflets are there on one leaf? — Count them! — Do all the leaves have the same number of leaflets?

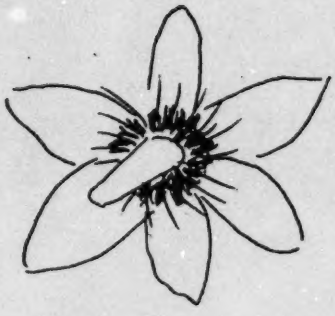
118

INVESTIGATION #11
TREES OF OHIO—Tulip Poplar

Name_____

WORKSHEET #2-M





Tulip Poplar

Other names for this tree are tuliptree and yellow poplar. It is very easy to see why this tree is called a tuliptree. The leaves take the shape of a tulip and the bloom resembles the flower of the tulip.

Squirrels like to eat the seeds. You can find a pile of tulip fruit cuttings under a tree that are as much as two feet high. Cuttings are the parts of the fruit that squirrels drop when they are eating the seeds.

The wood of this tree is very soft and can be easily sanded or carved. It cannot be used where strength is required.

Perhaps you will be lucky and find a flower from this tree. In the spring of the year, they often fall to the ground during a storm.

In the fall, look for the fruit containing the seeds. They will look like pine cones and stand straight up on the branches.

INVESTIGATION #11
TREES OF OHIO—Wild Black Cherry

Name _____

WORKSHEET #2-N

Wild Black Cherry

In the above drawing, you can find the bloom, fruit, seed, and leaf of the wild black cherry. The fruit of this tree is a favorite of many birds. They swallow the entire fruit, including the large seed. The bird does not digest this seed and it passes through the body. In this way, the birds spread the seeds in meadows, gardens, forests or any place where their droppings might fall. It is little wonder that you can find a wild cherry tree almost any place where a tree can grow.

The branches of the wild black cherry make excellent fishing poles. Boys and girls who do not have a cane fishing pole or a rod and reel often use branches from this tree for fishing. They will bend easily, but will not break easily.

When you are camping, you will also find that branches of the wild cherry tree make good wiener and marshmallow sticks for use at the campfire.

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INVESTIGATION #11
TREES OF OHIO—Willow

Name _____

WORKSHEET #2-O

Willow

There are many different kinds of willows, such as the black willow, the pussy willow, and the weeping willow. The weeping willow can be found throughout your city. Because they beautify the landscape and they grow quickly, people plant them near their homes.

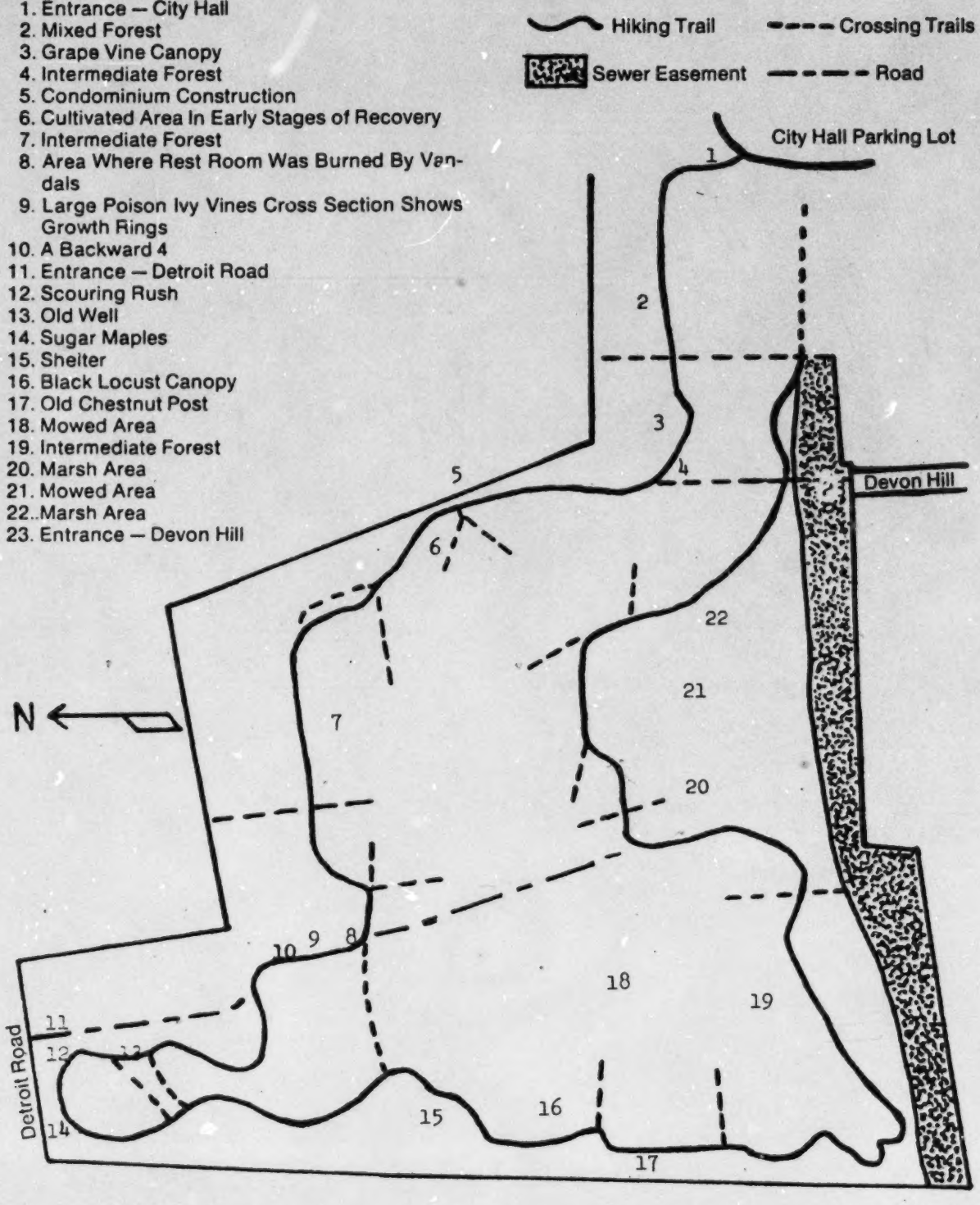
Are the leaves of the willow pinnately or palmately veined?

Are the leaves alternate or opposite in arrangement?

ROCKY RIVER CITY SCHOOL DISTRICT
OUTDOOR EDUCATION CENTER
Hiking Trail Map

AREAS OF INTEREST

1. Entrance — City Hall
2. Mixed Forest
3. Grape Vine Canopy
4. Intermediate Forest
5. Condominium Construction
6. Cultivated Area In Early Stages of Recovery
7. Intermediate Forest
8. Area Where Rest Room Was Burned By Vandals
9. Large Poison Ivy Vines Cross Section Shows Growth Rings
10. A Backward 4
11. Entrance — Detroit Road
12. Scouring Rush
13. Old Well
14. Sugar Maples
15. Shelter
16. Black Locust Canopy
17. Old Chestnut Post
18. Mowed Area
19. Intermediate Forest
20. Marsh Area
21. Mowed Area
22. Marsh Area
23. Entrance — Devon Hill



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THE ROCKY RIVER OUTDOOR EDUCATION CENTER
TREES ALONG THE HIKING TRAIL
BEGINNING ALL CITY HALL

1. Swamp white oak
2. Pin oak
3. Silver maple
4. Silver maple
5. White ash
6. Red oak
7. Sugar maple
8. American beech
9. White oak
10. White ash
11. American beech
12. American beech
13. Bitternut (pig nut)
14. Cucumber tree
15. Cucumber tree
16. Tulip poplar
17. Sassafras
18. Sugar maple
19. Shagbark hickory
20. American linden
21. Shagbark hickory
22. Pin oak
23. Tulip poplar
24. Muscle wood
25. Black oak
26. Pin oak
27. White ash
28. White ash
29. Pin oak
30. American elm
31. Quaking aspen
32. Red oak
33. Gray birch
34. Pin oak
35. Sweet cherry
36. Pussy willow
37. Wild black cherry
38. Apple
39. Box elder
40. American elm
41. Black locust
42. Box elder
43. Staghorn sumac
44. Box elder
45. Box elder
46. Norway maple
47. Wild black cherry
48. Sassafras
49. White ash
50. Wild black cherry
51. Sweet cherry
52. Wild black cherry
53. Sweet cherry
54. Catalpa
55. Red maple
56. American elm
57. Butternut
58. White ash
59. Sweet cherry
60. Wild black cherry
61. American elm
62. Mulberry
63. Black walnut
64. Mulberry
65. Black walnut
66. Sweet cherry
67. Sassafras
68. White ash
69. Sugar maple
70. Black walnut
71. Sugar maple
72. Sugar maple
73. Black walnut
74. Pin oak
75. Catalpa
76. American elm
77. Sweet cherry
78. White pine
79. Red maple
80. Hawthorn
81. Black walnut
82. White ash
83. Sweet cherry
84. Wild black cherry
85. Norway maple
86. Black locust
87. Black locust
88. Norway maple
89. Norway maple
90. Wild black cherry
91. Black locust
92. Norway locust
93. Mulberry
94. Mulberry
95. Black locust
96. Gray birch
97. American elm
98. Pin oak
99. Norway maple
100. Staghorn sumac
101. Cut leaf maple
102. Pin oak
103. White oak
104. American elm
105. White ash
106. American elm
107. Apple tree
108. Eastern cottonwood
109. Eastern cottonwood
110. Mulberry
111. Black locust
112. Staghorn sumac
113. Sassafras
114. Sour gum
115. Sweet gum
116. Black ash
117. White ash
118. Staghorn sumac
119. Mountain ash
120. Crab apple
121. Hawthorn
122. American elm
123. Red maple
124. Hawthorn
125. Willow
126. Quaking aspen
127. White ash
128. Sour gum
129. Eastern cottonwood
130. American linden

INVESTIGATION #12
Animals You Can Find Near Your Home

RATIONALE

Wild animals, pets and other domestic animals need the protection and care that can be given by humans. An understanding of how man is dependent on some animals and how they are also dependent on man is basic to being an informed conservation-minded citizen.

TERMINAL OBJECTIVE

The student will be able to explain the interdependence of sub-human animals and man, to identify the sub-human animals that are harmful and those that are helpful to man and to be aware of the needs and care of wildlife and other members of the animal kingdon.

BACKGROUND INFORMATION

Chipmunks The chipmunk belongs to the squirrel family and squirrels belong to a larger family called *rodents*. The chipmunk's short brown fur is marked with a strong black and white pattern. He is well camouflaged to blend in with his normal background of dry leaves. He is a small animal and he is always very busy keeping himself clean. He likes nuts, seeds, berries and buds. The chipmunk burrows his home in the ground. He always digs himself a front door and a back door. When he is scolding someone or something, he makes a loud chirping sound very much like a bird. For this reason we sometimes kiddingly call him the "furry bird".

Opossum When full grown, the common opossum is about the size of a house cat. The head is small, but it has a long narrow jaw set with fifty teeth. The feet are five-toed. Each toe on the forefoot has a long sharp nail that helps in climbing trees. Four toes on the hindfoot also have nails. The nailless first toe is used like a thumb to grasp branches. The tail, long and ratlike, also helps in climbing. There are two coats of fur; the inner coat is soft and short, and the outer is coarse, long, and a grizzled gray in color.

During the day the opossum sleeps in a burrow, brush pile, hollow log, or tree. At night it hunts in trees or on the ground. It grows fat from eating birds, frogs, fish, eggs, insects, and fruit. It climbs to the tips of branches to get cherries and mulberries. Its slowness makes it an easy prey of owls, wolves, foxes, and bears.

The peculiar way in which the opossum rears its young sets it apart from all other American animals. As many as a dozen are born at a time, each about half an inch long. Immediately they crawl into a pouch on the mother's abdomen. There they fasten themselves to the milk glands and remain helpless for about six weeks. When they first come out of the pouch they are the size of mice. For some time after that they ride around on their mother's back clinging to her fur and crawling back into her pouch to sleep. The kangaroo of Australia raises its young in the same manner.

Hunting the opossum with dogs is a favorite sport in the south on autumn nights. When surprised by the hunter, the opossum enters into shock and appears to be dead. From this trick has come the expression "playing possum".

Raccoon The word "raccoon" comes from an American Indian word meaning *"feeler"* or *"hand-scratcher"*. The raccoon has sensitive toes. With its handlike front feet a raccoon feels for insects in hollow logs or for fish in water. Raccoons seem to enjoy playing with pebbles or stones, rolling them about with their feet.

Brownish gray in color, a raccoon has a long bushy tail with several dark bands. Its face is small and pointed. The coloring of the fur around the eyes makes the raccoon look as if it were wearing a mask.

Raccoons live in wooded areas, usually near water. They are nocturnal which means they are active at night. They eat a variety of food; fish and insects as well as fruits and berries. They are often found very close to where people live. In some areas they are considered pests, for they may raid farms to feed on young corn. Every now and then they may steal a chicken. In Rocky River, raccoons live in the sewers. They are experts at removing lids from garbage cans to get to the scraps inside.

Although raccoons are usually gentle animals, they can be fierce fighters. Furiously clawing and biting, a raccoon can beat a dog twice his size.

Raccoons are good climbers and make their family homes in hollows high up in trees. In cold climates the raccoon will sleep away the worst winter days, coming out only when it is warm.

A mother raccoon bears two to six young. Usually she raises the cubs by herself. Mother and cubs live together in the den until they can take care of themselves. Raccoons sleep during the day and are active at night; they hunt in the trees as well as on the ground.

Ground Hog The ground hog is also known as the woodchuck. It is a brown, furry animal, born early in the spring in a burrow under the ground. When born, the ground hog is very tiny and has no hair, but its mother has a warm nest of grass

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for him. Usually there are three or four in a litter. The mother nurses the young just the way a mother cat nurses her kittens.

As soon as the young's eyes are open, it can go outside and find its own greens. When big enough, the young will dig a burrow. While the gound hog digs his new home, it must also get ready for winter. It eats grasses, seeds, roots, leaves, fruit and sometimes grasshoppers and June bugs. Since there is no food in winter, it eats all summer. By early fall, the ground hog will be so fat it can hardly hold its stomach off the ground.

When it grows colder, the ground hog will close itself up in an underground bedroom. The heart will beat slower, the body will become cool, the breathing will be slower and the animal goes into a deep sleep. The ground hog uses his stored fat for food and sleeps until March. This winter sleep is called hibernation.

When a ground hog is two years old, it will reproduce. When six, it will be old and gray. The claws are heavy and the muscles strong. The sharp rodent teeth grow all through life making it a good fighter if cornered.

Fox Squirrel This is the largest of all our squirrels. It is also the squirrel most likely to be seen in the Rocky River Outdoor Education Center and in our backyards. His long bushy tail helps him keep his balance as he jumps from tree to tree.

He likes to make his home in a hollow tree; but at the Outdoor Education Center, his home is often made of dried twigs and leaves and is located near the trunk of larger trees.

His tracks can be seen at the Outdoor Education Center in winter. At this time he is usually searching and digging for nuts that he buried in the fall.

Walnuts, hickory nuts, acorns, maple seeds, and other seeds provide an ample food supply for all squirrels making their home in the Outdoor Education Center.

Red Squirrel The smallest of our squirrels, it is not more than twelve or thirteen inches long. Its fine bushy tail makes the animal seem larger. The red squirrel can also be found in the Outdoor Education Center. It feeds on nuts and is very fond of pine cones.

Gray Squirrel This squirrel is found in Ohio, but not at the Outdoor Education Center. It is grayish in color and slightly smaller than the fox squirrel. The gray squirrel likes to travel on the ground, but is a good climber.

Mosquitos Mosquitos are common in most parts of the world. In temperate climates, they seem to appear suddenly when the weather turns hot. The mosquito lays its eggs on a damp surface. The eggs look like tiny black specks. If the water begins to dry up, the eggs will dry up, but they will not die. They will hatch when they become wet again. Mosquitos lay their eggs in *any* kind of water from the dew on leaves and grass to water in puddles and ponds to water standing in old cans.

Since mosquito eggs are so small, they are hard to find; so, look for black specks on sticks, and leaves near any surface of water. If you find some black specks, you may want to take them back to the classroom and watch them hatch. Put them in a container of water and wait a few days and see what happens in the warm classroom.

Take some magnifying glasses into the field, to help you find these black specks. The children may be surprised to see what hatches from the specks. Out will come a little wiggly thing that doesn't look like an adult mosquito at all. It is called a *"wriggler"* and is the second stage or *larva* of the mosquito.

Have the children use the magnifying glasses again and make some observations or try to answer these questions:

- Which end is the head?
- Can you find any legs?
- Does a wriggler have legs?
- How do they move?

When you see some wrigglers, add some crushed dog food or yeast to the water every few days. If scum forms on the water, clean it off. After a few days you may find some larval skins floating on the water. As a larva grows it sheds it skin four times.

After a few weeks you will begin to notice black things that are like commas in the water. These are wrigglers that have managed to live long enough and grow big enough to reach the next stage of development — the *pupa* stage.

Inside the covering of the pupa, legs and wings begin to form. When the mosquito is ready to come out, it pumps air into its stomach. This makes its body get larger and larger until the pupal covering breaks along a slit in the back. The mosquito can then step out onto the surface of the water and walk away from its pupal skin. It takes about an hour for the wings to dry and then it can fly away.

Unless you want mosquitos flying around the room, you had better be sure your pupae are in a jar with a screen or netting on top.

The mosquito has two wings, two eyes, two feelers or antennae, and six legs which makes it a member of the insect family. One of the best ways to tell a male and female apart is by the two feelers or antennae. A males's antennae are very bushy, while a female's have fewer hairs. The mosquito uses his antennae for feeling, tasting, and hearing.

Only the female mosquito bites. She needs the blood in order to be able to produce eggs. Most mosquitos fly only at night. If they come out during the day, they would be dried out or killed by the heat of the sun. In the daytime, they hide in the grass. Mosquitos can be found in the daytime in woods where it is cool and damp.

Mosquitos normally die of old age after 10 — 40 days. They are food for other insects, fish, birds, bats, frogs, and spiders. Cold weather kills the mosquito, but the female can lay eggs that will live through the winter waiting for the warm sun of spring.

Grasshopper Grasshoppers are found in all parts of the world. The female digs a hole in the ground with her abdomen into which she lays about one hundred or more fertilized eggs. The eggs, laid in the fall, hatch in the spring. The young grasshoppers are called *nymphs*. They are small and wingless, but they look like the adult in many ways.

As the nymph grows, it sheds its outer skin. This is called molting and is done about five times during the life of the grasshopper. The grasshopper lives only one season. It cannot survive the cold temperatures of winter and the lack of green plants which is its primary food supply.

Some interesting facts about the grasshopper include such items as:

1. The ears of the grasshopper are located on the sides of the abdomen just above the base of the third leg.
2. Breathing holes are also located on the abdomen. The grasshopper takes in air through small holes located along the sides of the abdomen. The insect does not have lungs as we do.

Ladybird Beetles Ladybird beetles are probably the best know and most valued of our beetles. It is a true insect with three pairs of legs, three body regions and a pair of antenna. Ladybird beetles are valuable to man because they eat aphids and scale insects which are so destructive to plants.

There are about 350 different kinds of ladybird beetles in the United States. The one most often found in Ohio is the fifteen — spotted ladybird. Unlike grasshoppers, which die in the winter months, adult ladybird beetles spend their winter by hibernating under fallen branches, leaves or under rocks or other objects resting on the ground.

Bees The honey bee is probably the best known of all insects. Honey has been obtained from wild bees far back into history. Early settlers used to seek out and cut down bee trees in the early fall. They would then remove the honey, often leaving the bees to starve. While in the process of making honey, bees pollinate fruit trees and other plants; it is without a doubt our most beneficial insect.

Bees live in colonies. A normal colony of honey bees may contain fifty-thousand bees among which will be a queen, workers and drones. Every once in a while, bees will swarm and the queen goes off to start a new colony leaving a young queen behind to maintain the hive.

Wasps Paper wasps are probably the one type of wasp that we get to know. The paper wasp builds an unprotected nest out of wood it chews up. The nest is hung under a roof overhang, in barns and other sheltered places. The bald faced hornet is a paper wasp that builds an oval enclosed nest. Some of these nests can hold as many as 10,000 hornets.

Praying Mantis Mantises are predators and feed mainly on other insects. In the fall, the female praying mantis lays several hundred eggs in an egg mass that dries and hardens to look like brown foam. When the young mantis hatches, he is cannibalistic and eats his brothers and sisters. Later he will search for and capture other insects.

There are a number of praying mantis egg cases that can be found at the Rocky River Outdoor Education Center. Many people pick such cases and place them in their garden to help control insects. No one should remove any praying mantis eggs from the Outdoor Education Center since this would disrupt the natural balance of the area.

TEACHING PROCEDURE

Whenever possible, explore the out-of-doors for signs of animal homes, food and tracks. If the students move through the forest or meadow very quietly, they may be fortunate enough to see most of the wildlife mentioned in the following activities.

The Rocky River Outdoor Education Center is an excellent area for studying animal life. When planning a trip through the center, arrange for volunteer field assistance provided by the Project ENRICH Office. These trained volunteers will instruct small groups of three to five students while in the field.

PRETEST

Students will point to and verbally identify the animals shown on *Worksheet # 1.*

POST TEST

Students will match the animal with the service it provides, the food it consumes or its habitat. Use *Worksheet # 2.*

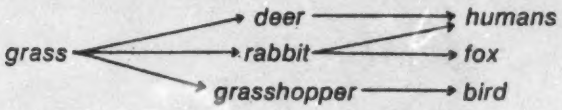
INSTRUCTIONAL OBJECTIVE #1

Each student will be able to give examples and discuss ways he or she depends on other ani-

mals for food, clothing, products, work, entertainment, etc.

Suggested Activities:

1. Distribute pictures of selected animals to students and ask them to tell how they are useful to humans.
2. List additional ways animals help man.
3. Provide an opportunity for students to identify product — producing animals.
4. Discuss ways that man has been kind to animals as well as ways he has been cruel to animals.
5. Below is a simplified food web:



Explain a food web to the students and ask them to construct one of their own. Identify the producers and the consumers in each food web.

INSTRUCTIONAL OBJECTIVE #II

Each student will be able to identify the following: chipmunk, deer, fox, grasshopper, honey bee, mosquito, moth, rabbit, raccoon, ladybird beetles, squirrel, wasp, ground hog, praying mantis and opossum.

Suggested Activities:

1. Show the students slides, photographs or overhead projections of the fourteen animals listed in the objective. Ask the students to identify each animal.
2. Classify these animals into groups of woodland mammals and groups of insects.
3. Instruct the students to color pictures of a few of the above animals. Ask students to include information on each animal when he assembles his scrapbook material. Use *Worksheet #3.*
4. Discuss habitats of several animals and compare differences and similarities.
5. Take a walk through surrounding areas and look for traces of animal life. Make plaster of paris casts of any good animal tracks you may find. Use *Worksheet #4.*
6. Ask each student to pick an animal and study the role and habits of the animal selected. Encourage students to use role playing in sharing information they have learned.
7. During a field trip, have students search for foods animals might eat and try to determine which animal uses each food found.
8. Explain why certain animals prefer a particular habitat.
9. Discuss the life habits of the chipmunk. Attempt to find a chipmunk home near your school. Whenever possible, observe the behavior of this small mammal. Use *worksheet #5.*

INSTRUCTIONAL OBJECTIVE #III

All students will be able to identify the basic needs of animals; these needs shall include food, water, oxygen, and shelter.

Suggested Activities:

1. Discuss the basic needs for life and list these needs in order of their importance.
2. Compare the needs of an insect, a woodland mammal, and a human.
3. Have each student select one animal and determine how this animal is equipped to live in his habitat.
4. Investigate why an animal builds its home the way it does.
5. Observe an ant farm and discuss how the ants way of life compares to that of a human.

INSTRUCTIONAL OBJECTIVE #IV

The student will be able to explain why some animals are helpful or harmful to people and plants.

Suggested Activities:

1. Give examples of animals that are helpful to man and indicate how they are helpful.
2. Give examples of animals that are harmful to man and indicate how they are harmful.
3. Discuss how to control insects that are harmful to plants and man.
4. Bring to class plants or parts of plants that have been damaged by insects. Try to determine what insect caused the damage.
5. Invite a nurseryman to discuss "Insects of the Yard and Garden".
6. When on a field trip to an open area, look for evidence of insect damage and look for evidence of insects that are helping plant life. Attempt to find such beneficial insects as the praying mantis, lady bug, and honey bee and also attempt to find harmful insects such as moths, mosquitos and flies.

   Be a good Ecologist! Do not make insect collections.
7. Attempt to hatch mosquitos in the classroom or bring in wrigglers and observe the wriggler behavior and development. Use background information and *Worksheet #6.*

INVESTIGATION #12
Animals You Can Find Near Your Home

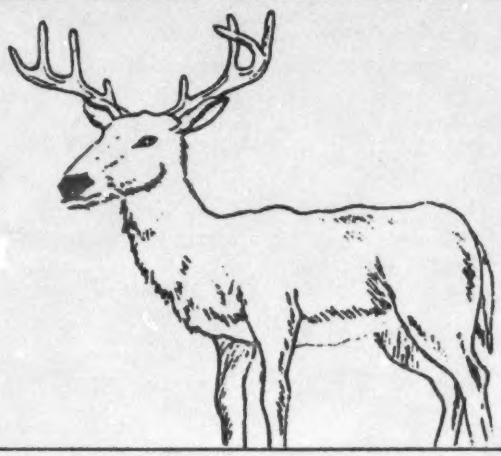
Name _____

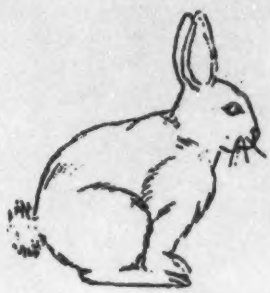
WORKSHEET #1

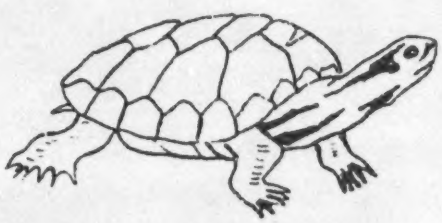
Can you name these animals? Tell your teacher what they are.

1.

2.

3. 

4. 

5. 

6.

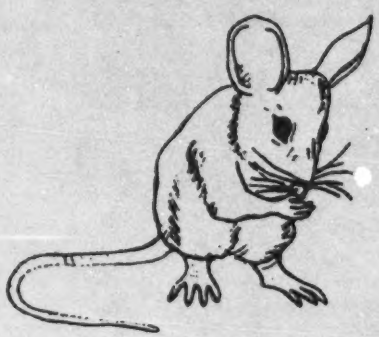
INVESTIGATION #12
Animals You Can Find Near Your Home

Name _____

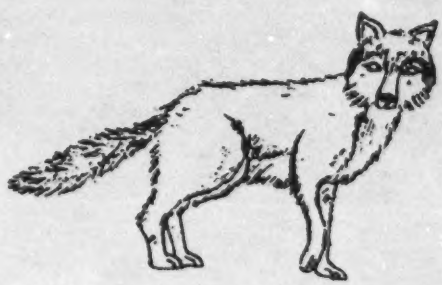
WORKSHEET #1

Can you name these animals? Tell your teacher what they are.

1.

2. 

3.

4. 

5.

6.

INVESTIGATION #12
Animals You Can Find Near Your Home

Name _____

WORKSHEET #2

Draw a line from the animal named to the food it eats or to the service it provides. Some of the animals listed may have more than one line running from the name.

Animal	Food or Service
Sheep	Clothing
Cow	Food
Horse	Grass
Opossum	Hay
Rabbit	Fur
Raccoon	Wild grapes
Fox	Clover
Fish	Fish
Grasshopper	Crayfish
Praying mantis	Mice
	Insects
	Transportation

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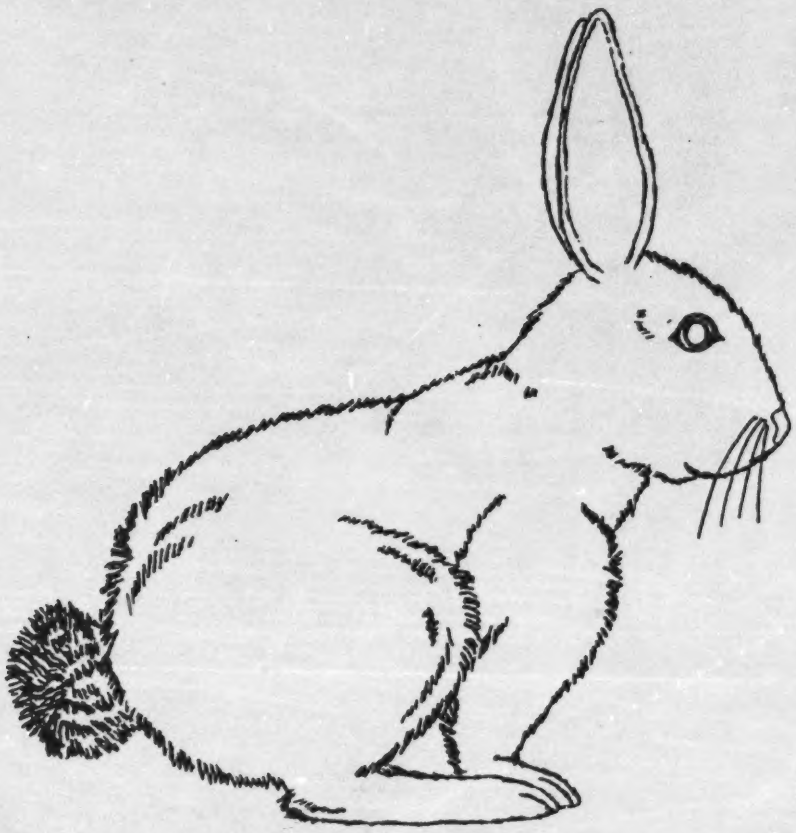
INVESTIGATION #12
Animals You Can Find Near Your Home

Name _____

WORKSHEET #3

Color Me



INVESTIGATION #12
Animals You Can Find Near Your Home

Name _____

WORKSHEET #3

Color Me

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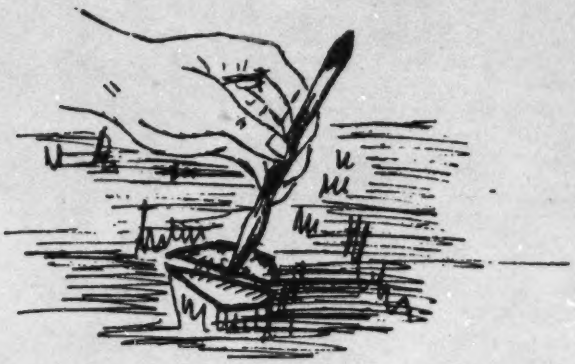
INVESTIGATION #12
Animals You Can Find Near Your Home

Name _____

WORKSHEET #4

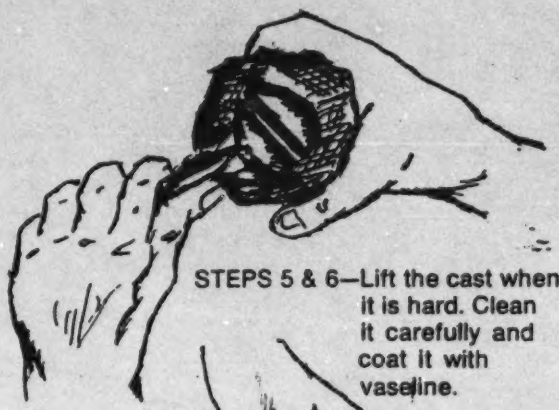
Casting Animal Tracks



STEPS 1 & 2—Clean the track and spray it with shellac or plastic.

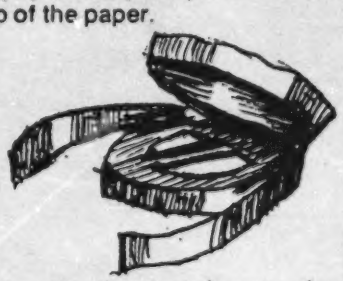
STEP 3—Encircle the track with cardboard pressed into the soil.

STEP 4—Pour plaster of Paris mixture over track.



STEPS 5 & 6—Lift the cast when it is hard. Clean it carefully and coat it with vaseline.

STEP 7—Surround the casting with a wide strip of paper and pour plaster level with the top of the paper.



STEP 8—Separate the two layers of casting. Clean the vaseline from the track and smooth it with a knife blade.

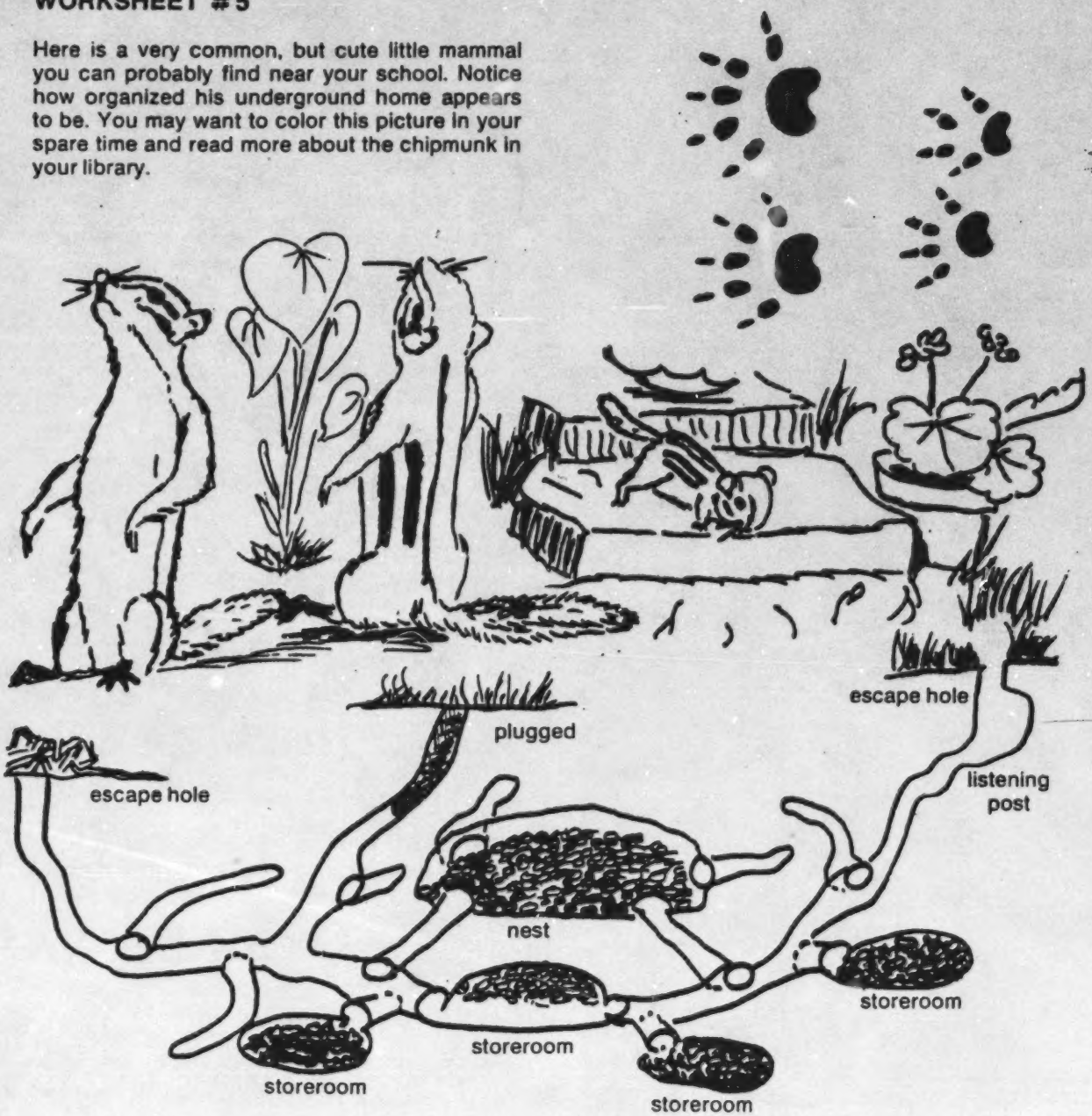
STEP 9—When the cast is dry, paint the inside of the track with black India ink.

INVESTIGATION #12
Chipmunk

Name _____

WORKSHEET #5

Here is a very common, but cute little mammal you can probably find near your school. Notice how organized his underground home appears to be. You may want to color this picture in your spare time and read more about the chipmunk in your library.



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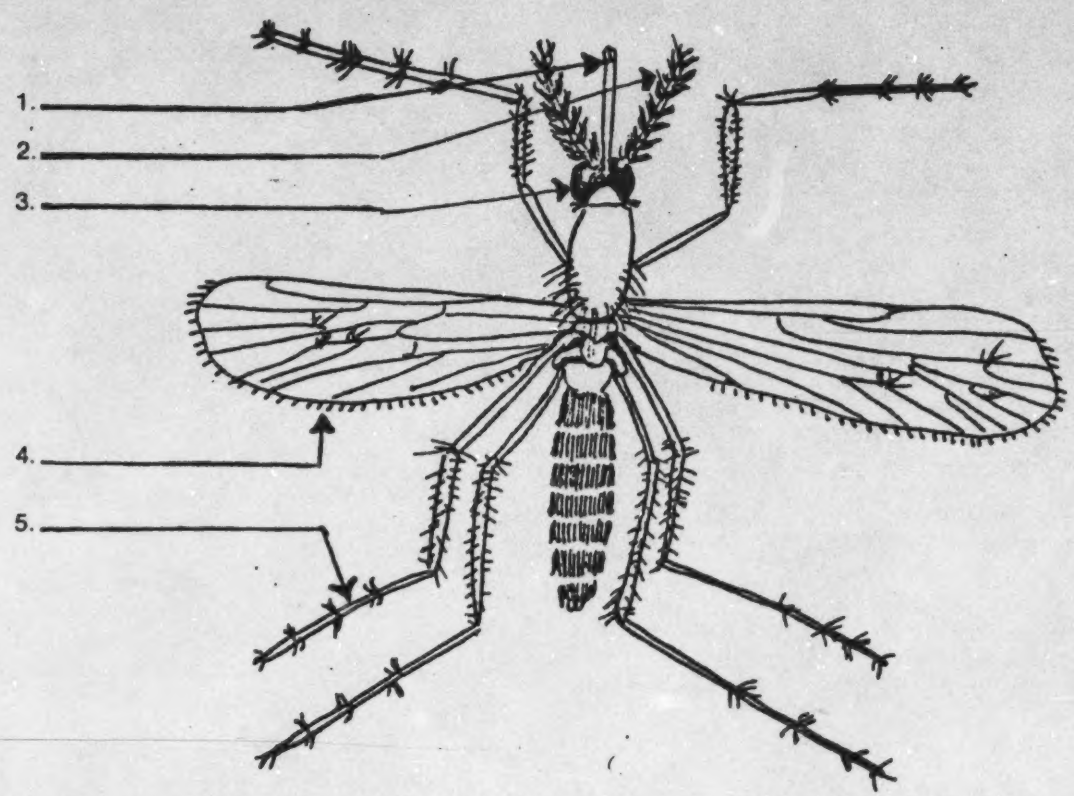
INVESTIGATION #12
Mosquito

Name _____

WORKSHEET #6

A. Label the parts of the mosquito indicated in this drawing.



B. The four life stages of the mosquito are:

1. _____ 2. _____

3. _____ 4. _____

C. The chart below shows how many times an animal was bitten by mosquitos:

Animal	No. times bitten
cow	238
pig	69
dog	17
chicken	9
goat	125
man	24
cat	18

D. What animal was bitten the most?_____

Why?_____

E. What animal was bitten the least?_____

Why?_____

INVESTIGATION #13
Reading a Map of Ohio

RATIONALE

As residents of the state of Ohio, students should be able to use the map of our state as a guide to traveling and become acquainted with the geographic location of our major cities and boundary states.

TERMINAL OBJECTIVE

Students will be able to use the map of Ohio with 90% accuracy.

INSTRUCTIONAL OBJECTIVE #1

Students will become acquainted with the shape and location of Ohio.

Suggested Activities:

1. *Worksheet #1*, illustrating the outline of Ohio can be used as a model to be traced by students. The worksheet can be made into a transparency.
2. The transparency can be projected and used to draw a larger scale map of Ohio on paper. Using this larger drawing, the students can draw in the cities, rivers, places of interest, etc.
3. Using *Worksheet #2*, the student can visualize the size and location of Ohio in relation to the rest of the United States.
4. On *Worksheet #2 and #3*, have students identify the states that border Ohio.
5. Using *Worksheet #2 and #3*, have students identify the bodies of water that form boundaries of Ohio.
6. By using a mixture of the proportions of two cups flour, one cup salt, and one and one-half cups of water, have students make their own salt maps of Ohio.
7. Review compass directions by asking what state lies to the east of Ohio, etc.

INSTRUCTIONAL OBJECTIVE #II

To acquaint students with the location of major cities, and rivers in Ohio, as well as places of interest.

Suggested Activities:

1. Use *Worksheet #3* to help orient the students to the location of various cities in Ohio. More cities may be added if the teacher feels it is necessary.
2. Make a large map of Ohio for the bulletin board. Use location cards (index with cities, rivers, etc., written on them). Have the students select a card and place it in its proper place on the map.
3. Have the students give a report on any city or place of interest in Ohio he/she has visited.
4. Have each student locate the following on a commercial map.

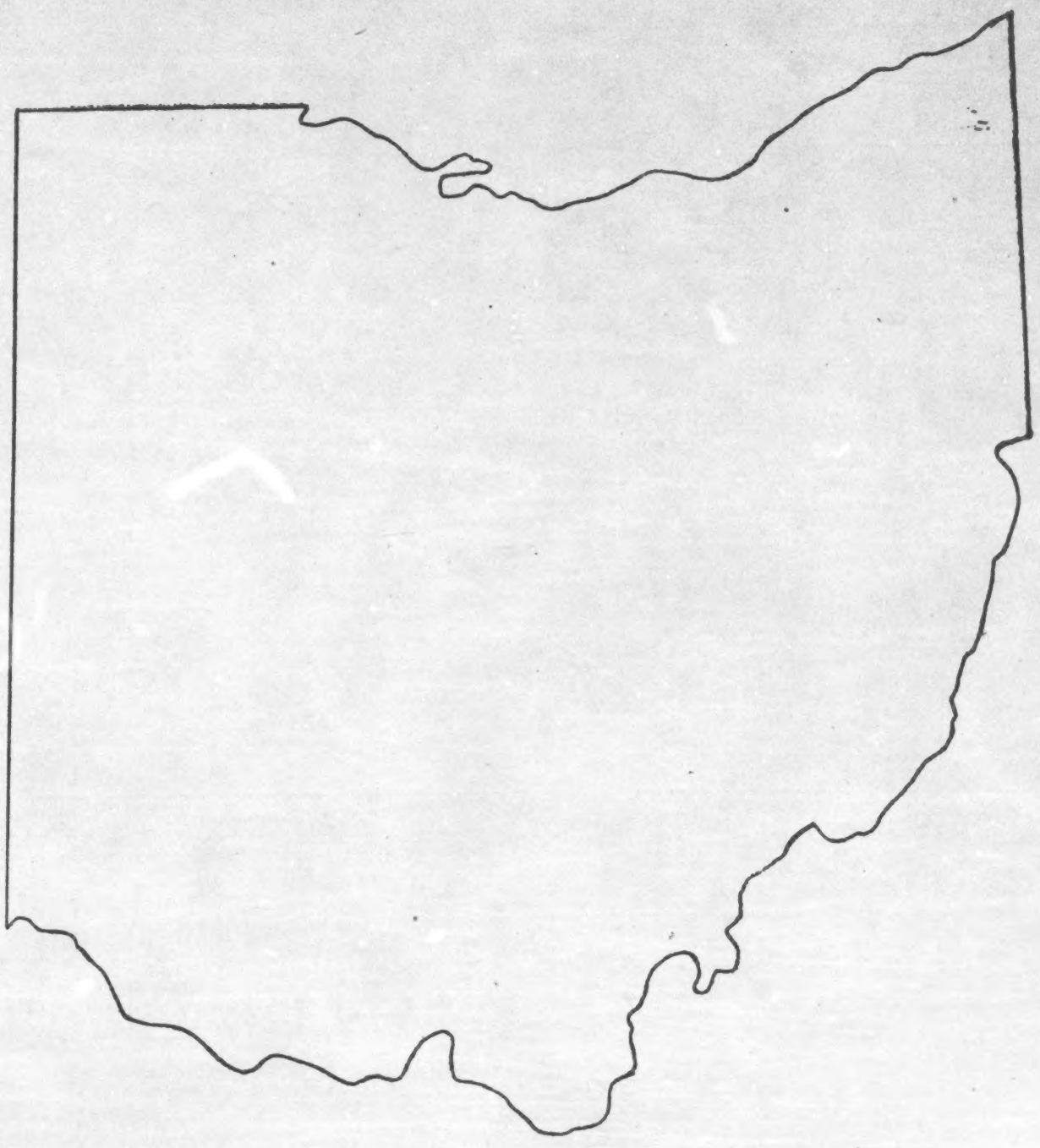
Akron	Toledo	Lake Erie
Canton	Dayton	Ohio River
Cleveland	Columbus	Muskingum River
Youngstown	Cincinnati	Cuyahoga River
		Rocky River

5. Using a commercial map, have the students locate state forests, lakes and state parks in Ohio.
6. Using the commercial map of Ohio as a guide, have the students place the rivers, state forests, lakes, etc., on the Ohio map, *Worksheet #1*.
7. Discuss with the class the importance of rivers in Ohio history.
8. Using *Worksheet #1*, have students draw in the Cuyahoga River and label large cities that are on its banks. Use a commercial map as a reference.
9. Use a commercial map as a bulletin board display. With yarn and pins, locate important cities and points of interest in our state.
10. Plan a trip to one of the points of interest in Ohio. Using a commercial map of Ohio, have students show which routes they will take to reach their destination and what large cities they will be going through.

INVESTIGATION #13
READING A MAP OF OHIO

Name _____

WORKSHEET #1



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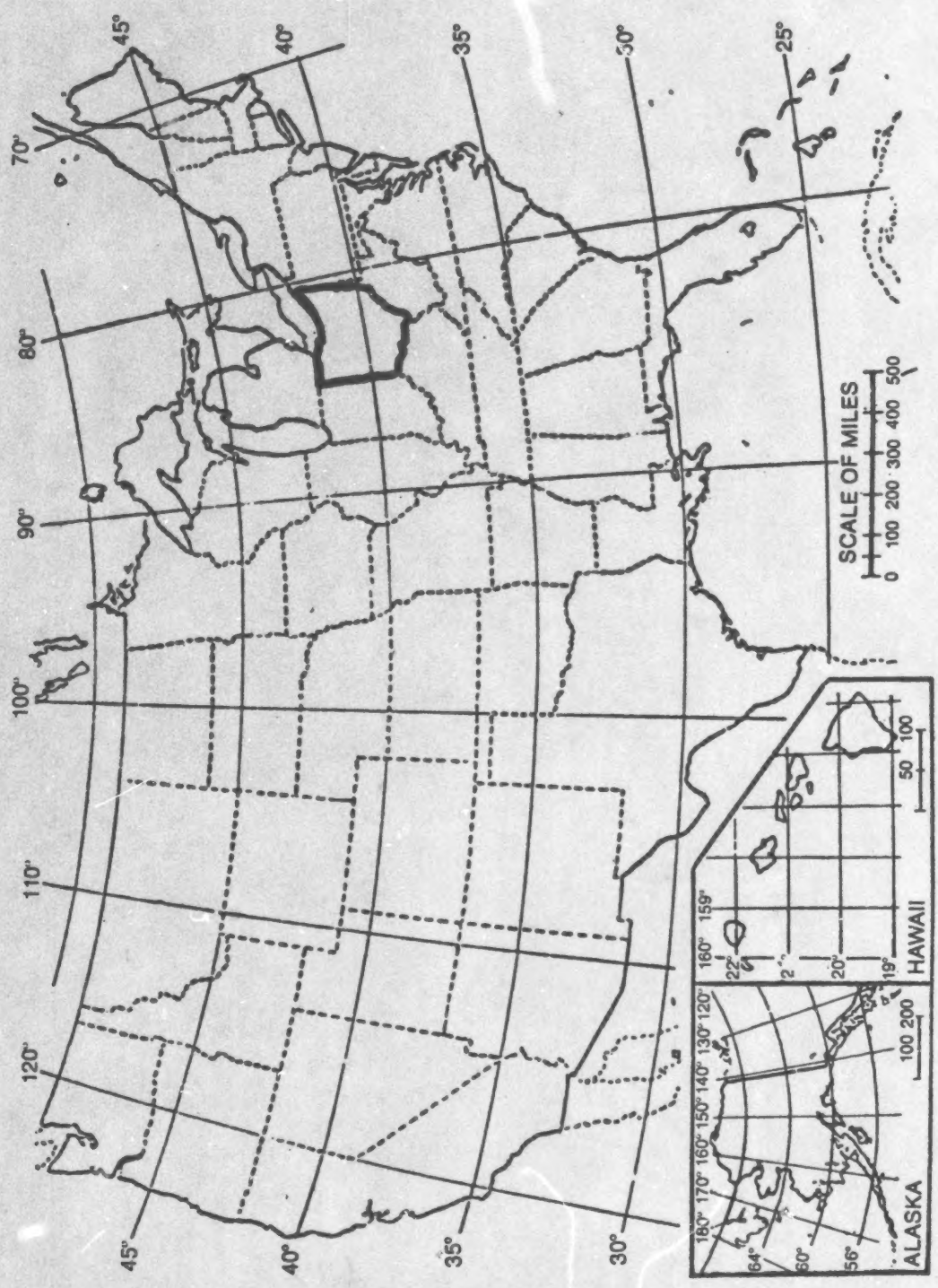
INVESTIGATION #13
READING A MAP OF OHIO

139

Name _____

WORKSHEET #2

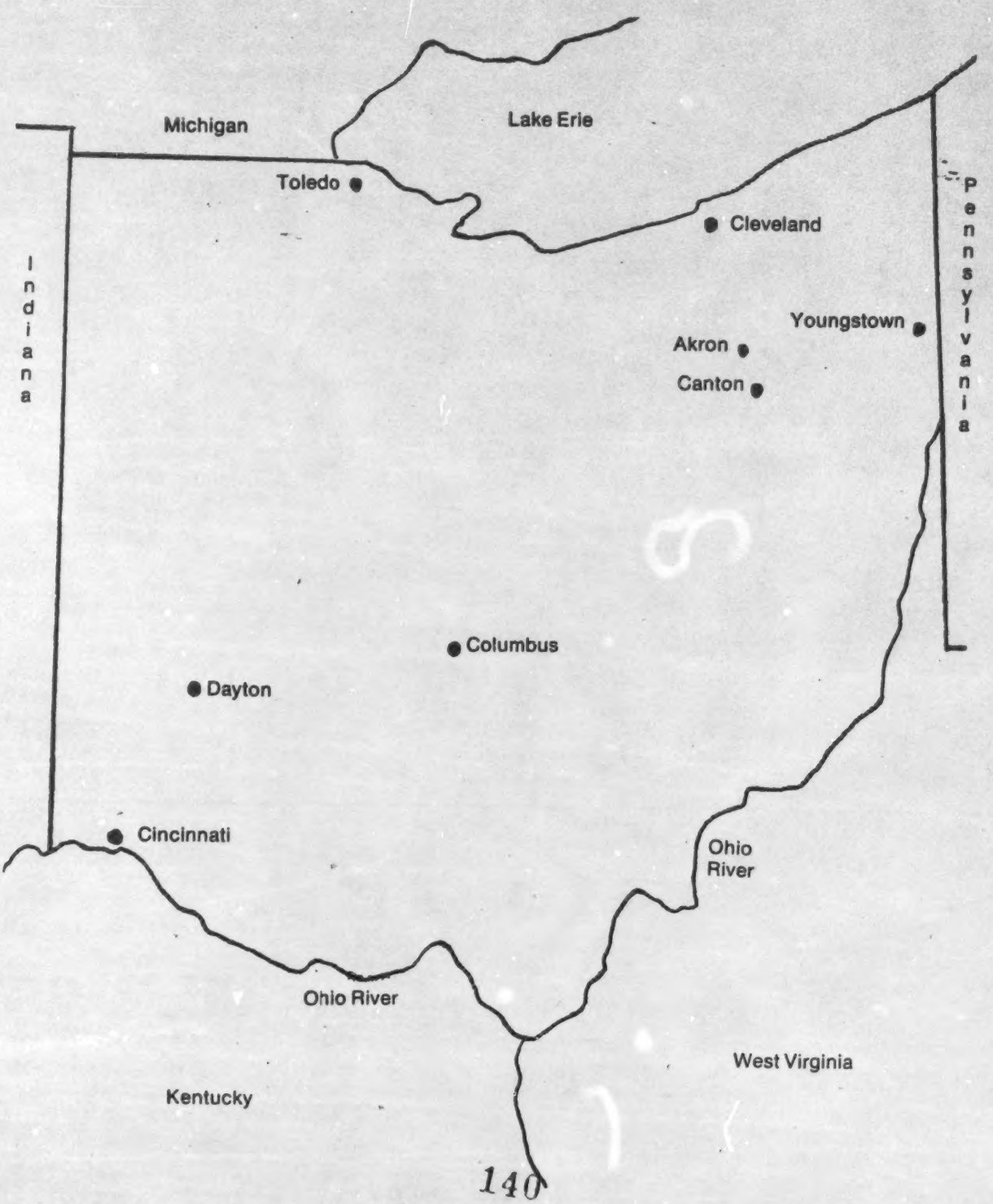


138

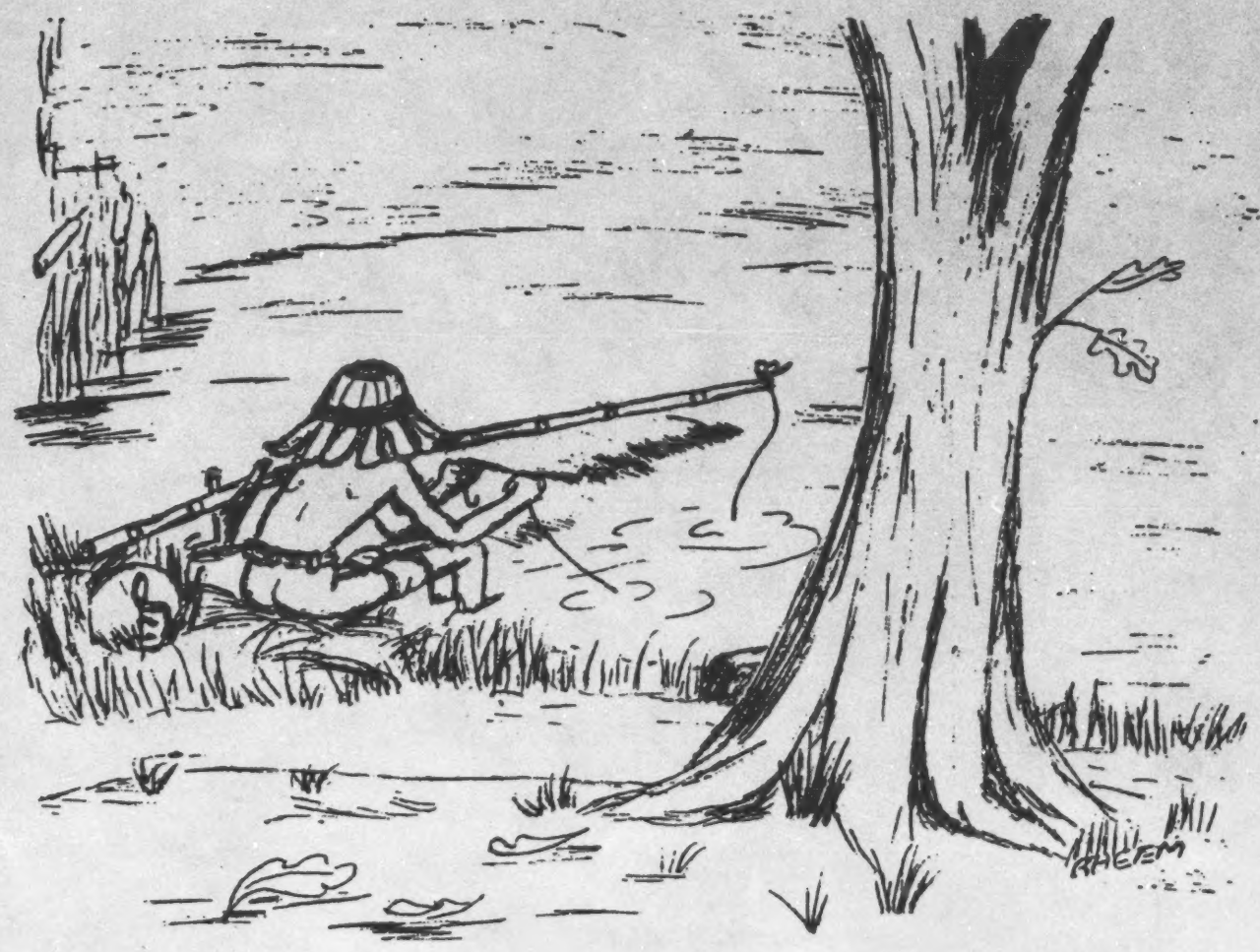
INVESTIGATION #13
READING A MAP OF OHIO

Name: _____

WORKSHEET #3



INVESTIGATION #14
FISHING AND FISHES



A Time to Remember

RATIONALE

Not only is fishing a relaxing and healthy activity, it is an excellent opportunity for students to become aware of the ecology of ponds, streams and lakes. How the fish hears, sees, obtains oxygen, moves, captures its food and reproduces are all factors that can be studied by providing fishing experiences for students. In addition, students who collect their own bait will become more aware of the nature of the habitats of such animals as crickets, grasshoppers and earthworms.

It is possible that a fishing experience can be used as reinforcement for measurement skills. Whose fish is the longest? Whose fish is the shortest? How long is the biggest bluegill, bass, carp, or catfish? These are all questions that provide competition and motivate the development of measurement skills.

TERMINAL OBJECTIVE

While fishing, the participating student will experience a recreational activity that can be appreciated and practiced during his/her entire life-

time and be constructively involved in a pastime that is directly related to an awareness of ecology.

BACKGROUND INFORMATION

Bates Pond, Rocky River, Ohio can be used as the primary fishing water. Permission must be secured from the Rocky River city officials prior to planning a fishing trip to Bates Pond. This permission can most easily be secured by establishing a fishing date with the Project ENRICH secretary and requesting that she make the necessary arrangements.

Bates Pond is located south of the Rocky River Sewage Treatment Plant. Access to the area is from Lake Road just opposite the steel pier that extends into Lake Erie. The fish population in the pond is far too excessive for the available food supply and as a consequence, the fish are often stunted.

The representative species of fish that can be caught at Bates Pond are: catfish, bluegill, carp, and bass. Information related to each of these fish is included and can be shared with the students.

Carp . . . Carp were brought to Europe from Asia and from Europe to America in the 1870's and 1880's. They reproduced and grew so successfully in the United States that they are now found from coast to coast in lakes, ponds, and slow-moving rivers and streams.

Carp are bottom-feeders living primarily on insects and dead animal life. They are sometimes considered the scavengers of the water and can grow up to three feet long and weigh as much as thirty pounds.

In some countries, like Japan, the carp is considered an important food fish. On certain holidays, large kites resembling carp are flown from Japanese roof tops; there is a kit for each child in the family.

Carp are used as a primary source of food in many parts of the world. They are easily raised in ponds and not too selective in the types of food they will eat. Some students will probably remember how eagerly the carp will eat bread when it is tossed to them in ponds and lakes where carp are plentiful (Pymatuning Lake, Cedar Point Lagoons, etc.).

Catfish . . . Catfish can be found in Lake Erie and ponds and streams throughout Ohio. In the southern part of the United States, they are considered a delicacy and can be found on the menu of some of the best restaurants.

Most of the catfish that will be caught at Bates Pond will be a type called *bullheads*. The bullhead is a small catfish which rarely grows to be a foot long or weigh over two pounds. They live in muddy ponds and streams and may survive in mud even when the ponds dry up during dry spells. They feed on almost any kind of plant and animal life they can find on the bottom and are particularly fond of worms, snails, crayfish, insects, and minnows.

Bullheads lay their eggs in the spring in a nest scooped out in the hard bottom of a pond, lake, or stream. The male watches the nest and guards the young once they hatch.

Catfish may get as large as twelve feet long (found in Europe) and the blue catfish found in the Mississippi watershed can weigh as much as 150 pounds.

The whiskers near the mouth of the catfish are called *barbels*. Due to their well-developed sense of touch, the barbels help the fish feel in much the same way as our fingers help us in feeling by touching. Catfish also have sharp spines on their fins. These spines not only hurt when they are touched, but can cause irritation and infection if the penetrate the skin. *It is important to be careful when taking a catfish from a hook.*

Bass . . . Many fishermen feel that the bass is the finest freshwater game fish. When caught it often "fights" by leaping out of the water.

There are two primary kinds of bass found in Ohio. The smallmouth bass is most often found in cooler waters near Cleveland and Lake Erie; it originally was a native of Northeastern United States, but can now be found in Canada and throughout the Western United States. The smallmouth bass does not live successfully in the warm waters of the Gulf States, however.

The largemouth bass can be found in our region, but prefers the warmer waters of the south. This bass grows to a larger size than the smallmouth and is a very successful fish in the farm ponds throughout Ohio.

Bass lay their eggs in a nest scooped out of gravel. Once the eggs are laid by the female, the male fertilizes them and stands guard until they are hatched. The favorite diet of the bass consist of minnows, worms, frogs, and insects. They are often caught on artificial lures that resemble these preferred foods.

Bluegill . . . Bluegills are the most plentiful fish in Bates Pond. They are members of the sunfish family and weigh about ¼ lb. when mature and live in water where there is an abundant food supply. They prefer worms and insects as food, but they are also eaten by larger fish such as bass and catfish.

Bluegill fishing is very popular in inland lakes throughout Ohio. They are among a group of fish the fishermen call *panfish* and some people think that they are the tastiest fish for eating purposes.

TEACHING PROCEDURE

The primary purpose of this investigation is to involve youngsters in an activity that is educational and yet develop an interest in a recreational outlet that can be appreciated during one's lifetime.

The culminating activity is a fishing trip. The activities leading up to this trip should include:

1. A study of the types of fish the student might possibly catch.
2. A study of how fish eat, swim, hear, secure oxygen and reproduce.
3. A study of what foods carp, bass, bluegill, and catfish prefer.
4. Where insects and worms can be found and why they live in the habitats they do.

The instructor will undoubtedly have no difficulty in finding high school students or adults who are ardent fishermen/women and who will be more than happy to visit the class and demonstrate and discuss:

1. Safety when fishing
2. How to tie artificial lures
3. How to clean and fillet fish
4. How to cast and use spinning and other fishing tackle
5. Habits of fish and how to catch them.

For safety purposes, the barbs of all hooks used by students should be filed off. This makes fishing more challenging, but it also makes it easier to get hooks out of fingers.

INTRODUCTION

When introducing this investigation, encourage the students to share their fishing experiences and knowledge with the class. Perhaps your students will suggest setting up and caring for an aquarium. Such an aquarium can be used to keep bullheads, bluegills and other fish that can be caught in local waters. Care for the fish and the aquarium can be an individual responsibility of willing students.

PRETEST

Ask the students to verbally identify a bluegill, catfish, bass and carp. Use laminated pictures of each fish for testing purposes.

POST TEST

Have each student match the carp, bluegill, catfish and bass with the correct food and habitat. Use *Worksheet #1.*

INSTRUCTIONAL OBJECTIVE #I

Students will verbally share personal experiences at fishing, describe the types of fish the may have caught and tell where (location) they were caught.

Suggested Activities:

1. Permit the students the opportunity to bring to class family pictures of fishing trips or pictures of the types of fish they may have caught. Photographs from fishing magazines or books related to fish may be used to help the student recognize fish he has seen or caught.
2. Have an open discussion about fishing. Encourage the students to voice their likes and dislikes for this recreational activity.

INSTRUCTIONAL OBJECTIVE #II

The student will be able to identify the eyes, gills, gill covers, fins, nostrils, teeth, scales and lateral line of a fish and verbally tell the function of each.

Suggested Activities:

1. Each student should be given a copy of *Worksheet #2.* The parts of a fish are clearly labeled and the students are to find these parts on a preserved perch provided by the instructor.
2. Discuss:
   a) How a fish takes oxygen from the water that flows over its gills. Have the student lift the gill covers and observe the gills.
   b) Where are the ears of the fish? — Sensory organs under the lateral line of the fish are sensitive to vibrations in the water. There are no visible ears. After the students have attempted to find fish ears, help them understand how a fish hears.
   c) Ask the students to open the mouth of the fish and try to find the teeth. Discuss if the perch uses its teeth for grasping, chewing, or biting. The primary food of the perch is minnows. Discuss how these teeth help the perch catch and eat minnows. (Minnows are swallowed whole.)
   d) With the use of a hand lens, have the students examine the scales of the fish. Discuss how the scales help protect the fish, provide flexibility for swimming and how you can tell how old a fish is by counting the rings on a scale. (This is hard to determine without the use of a microscope.)
   e) Count the number of fins on the perch. Discuss how fins help the fish swim. If an aquarium is set up, observe how the fish uses its fins for swimming.
   f) Fish cannot see well and there is some question as to their ability to smell. Have the students observe the nostrils and eyes of the perch. How do these organs differ from ours? How are they the same?

INSTRUCTIONAL OBJECTIVE #III

Participating students will understand how fish reproduce.

Suggested Activities:

1. Most fish reproduce by laying eggs and having them fertilized by sperm. Guppies and

some other aquarium fish bear the young alive. Set up an aquarium with several pairs of guppies and carefully observe if young are born.

2. Explain that the roe found in most female fish is really eggs and that these eggs are laid in shallow nests generally on gravel bottoms of streams, ponds and lakes. Once the female lays the eggs, the male covers them with milt (sperm). Use *Worksheet #3* to help in the explanation. Discuss how the male fish often protects the nest; that the newly-hatched fish are called *fry* and that newly-hatched fry are often eaten by other fish.

Students might be interested in knowing that caviar is considered a delicacy and might be even more interested in finding out how expensive it is to purchase.

INSTRUCTIONAL OBJECTIVE #IV

Participating students will learn how to collect worms, crickets, and grasshoppers for use as fishing bait.

Suggested Activities:

1. Construct cricket traps as instructed in *Worksheet #4*; if it is fall, students should set them in their backyards or on the school grounds.
2. Take a field trip to a meadow and explore where crickets and grasshoppers can be found. Kick up the grass in the meadow and decide how you can best catch the grasshoppers that fly out; look under logs and boards for worms and crickets. Discuss why these animals are found in such habitats and what protection and food they need.
3. During the spring, encourage the youngsters to look for night crawlers. These animals (large earthworms) can best be found after it gets dark and on rainy spring nights. Discuss why night crawlers come to the surface only at night and most often on rainy nights. A flashlight can be used to find these animals, but it takes a quick hand to catch them.
4. Use the food chain diagrams on *Worksheet #5* to help explain the role of the bait in the fishes food web.
5. Ask the students to dig in their garden or compost pile for worms. Do not miss the opportunity to discuss why they live there, what they eat and how they get their oxygen supply.
6. Start a worm colony in the classroom. Don't try to keep too many worms at one time. Follow instructions given on *Worksheet #6*.
7. On the day before your fishing trip, make an all-out effort to collect bait. Do this as a class activity if possible.

INSTRUCTIONAL OBJECTIVE #V

Students will cooperatively assemble their fishing pole, line, sinker, hook and bobber.

Suggested Activities:

1. Follow the instructions provided on *Worksheet #7*. Encourage the students to be accurate in their measurements. There should be one set of equipment for every two students.
2. Attach students names on the prepared poles and lines; fasten the two halves of the pole together with rubber bands and make sure that the line is neatly wrapped around the end of the pole with the hook embedded in the cork bobber.

INSTRUCTIONAL OBJECTIVE #VI

Participating students will become involved in a fishing contest in which they must identify and measure the fish they catch.

Suggested Activities:

1. Plan a fishing derby to be held at Bates Pond. Students work in teams of two and each student is to fish for a period of thirty minutes. (One half of the class will fish at one time.) As the fish are caught, the student should complete the information on *Worksheet #7* and then release his catch. Teachers and volunteers should help the student complete and check his records.
2. If possible, fish in the morning and have a picnic lunch at a park of your choice. At the conclusion of lunch, give some type of award for the longest fish, the shortest fish and the most variety of fish caught.

HAVE FUN FISHING —
BE A GOOD SPORTSMAN —
LEAVE YOUR FISHING AREA CLEAN

INVESTIGATION #14
POST TEST—FISHING AND FISHES

Name _____

WORKSHEET #1

A. What food do the following fish normally eat? Place the correct numbers in the spaces next to the name of the fish.

1. Worms
2. Crickets
3. Grasshoppers
4. Flies
5. Snails
6. Crayfish (Living)
7. Crayfish (Dead)
8. Minnows (Living)
9. Minnows (Dead)
10. Frogs (Living)
11. Frogs (Dead)
12. Garbage

1. Carp: ____, ____, ____, ____
   ____, ____, ____, ____
   ____, ____, ____, ____
2. Bluegill: ____, ____, ____, ____
   ____, ____, ____, ____
   ____, ____, ____, ____
3. Catfish: ____, ____, ____, ____
   ____, ____, ____, ____
   ____, ____, ____, ____
4. Bass: ____, ____, ____, ____
   ____, ____, ____, ____
   ____, ____, ____, ____

B. Some fish can live in badly polluted water while others need water that is not too polluted. If you were fishing in the following places, what fish might you expect to catch? Use letter only.

A. Carp
B. Bluegill
C. Catfish
D. Perch
E. Bass

1. Lake Erie: ____, ____, ____, ____
2. Mouth of Cuyahoga River: ____, ____, ____, ____
3. Mouth of Rocky River: ____, ____, ____, ____
4. Where Cuyahoga River begins: ____, ____, ____, ____
5. Where Rocky River begins: ____, ____, ____, ____
6. Bates pond: ____, ____, ____, ____

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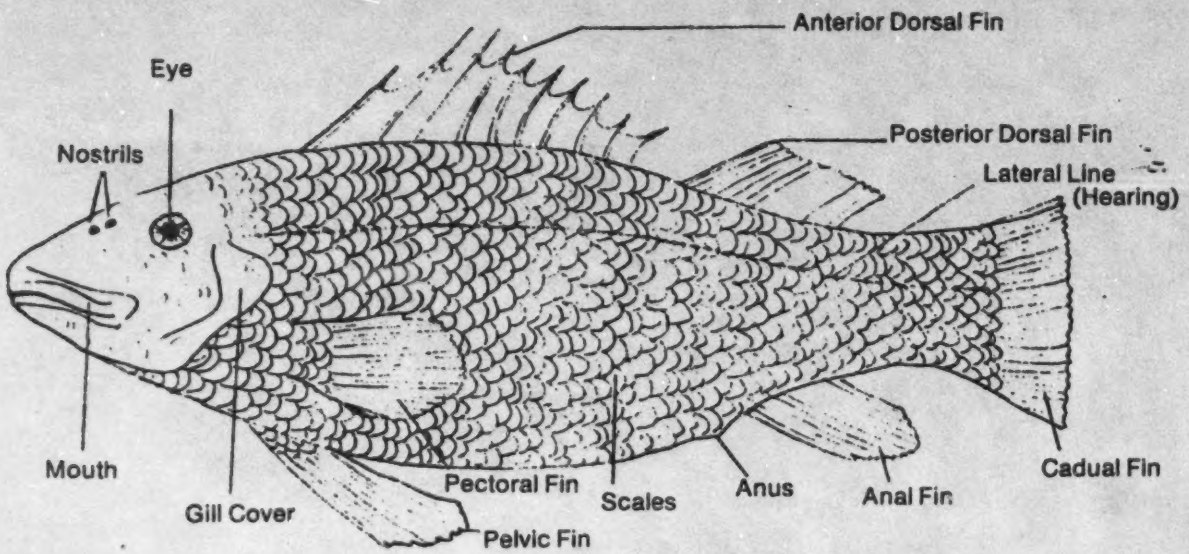
INVESTIGATION #14
Fishing And Fishes

Name _____

WORKSHEET #2



Each of you has been given a fish which has been placed in a liquid that keeps it from decaying. This particular fish is a perch and can be caught in great numbers in Lake Erie. Perhaps you have caught and cleaned perch and know how tasty they are when fried.

Before you touch your fish, make sure that your teacher has washed it by letting cold water run run over the perch for at least three minutes. It would also be wise not to rub your eyes with your hands while working with the fish. The smelly stuff on scales and fins may make your eyes burn, but will not hurt them.

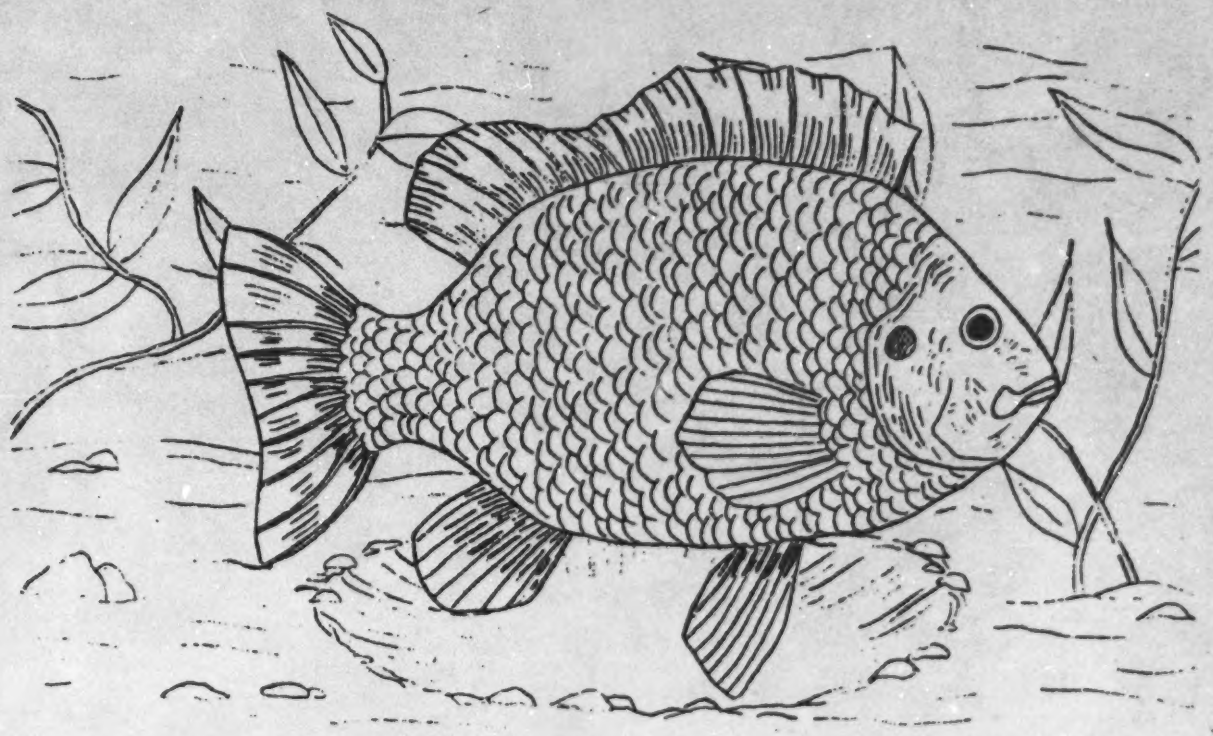
A. Place the perch on a piece of paper towel and by examining the list, complete the following questions:
   1. How many inches long is your fish? _____
   2. How may fins does your fish have? _____
   3. Does your fish have teeth? _____
   4. Does your fish have ears? _____
   5. Does your fish have a tongue? _____
   6. Does your fish have a nose? _____

B. Your teacher will help you with the following:
   1. Lift the gill plates and look at the gills.
      a) Describe the gills.
      b) What do they do for the fish?
      c) Discuss how they work.
   2. Find the line along the side of the fish where hearing takes place.
      a) Discuss how a fish hears.
      b) Can you hear when your head is underwater? Why or why not?
   3. Discuss how the eye of a person and the eye of a fish are alike and how they are different.
   4. A perch swallows a minnow without chewing it. Does it swallow the minnow head first or tail first. Give reasons for your answers.
   5. If we cut open a fish, we would find it has a heart, brain, liver, stomach, intestines and even a gall bladder. We would also find that it has a large air sac. Discuss how such a sac could help the fish live in water.

INVESTIGATION #14
Fish and Fishes

Name _____

WORKSHEET #3



A. Answer the following questions:

1. Do all fish lay eggs?
2. What are the tiny fish that hatch from eggs called?_ _____
3. Thousands of fish eggs may be laid, but many do not hatch. Why?_ _____

_ _____

_____

4. Of the many fish that hatch, only a few grow to full size. Why?_____

_ _____

_____

B. When a fish is laying her eggs, she is "Spawning". Many fish spawn in shallow nests as shown above, some spawn in holes in the banks of ponds or streams and some build special nests from green plants where they will lay their eggs. Most fish spawn in the same water where they live all year, but some, like the salmon, travel many miles to lay their eggs. Your teacher will help you find out more about the spawning habits of the salmon and its relatives. (Including Coho.) Perhaps you can discuss these habits during class.

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INVESTIGATION #14
Trapping Crickets

Name _____

WORKSHEET #4-A

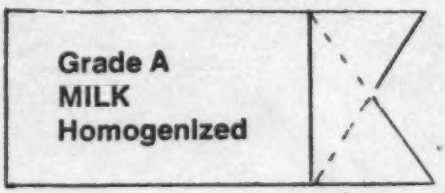
One way to catch crickets is to lift up logs and stones and hope that a cricket is living there. This is best done in late summer and early fall.

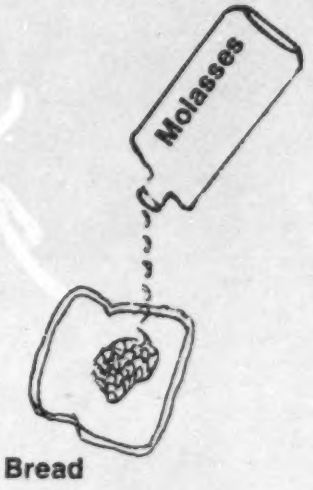
Another way to catch them is by trapping. There are two kinds of traps that are easy to make. They are illustrated in this investigation. Once again, cricket traps are most successful in late summer and early fall.

The Milk Carton Trap

You will need one paper milk carton which is open on one end, brown molasses and a slice of bread.

1. **Pour some molasses on a slice of bread and place it in an open milk carton. The milk carton should be placed on its side so that the crickets can easily crawl into the open end.**
2. **Set the milk carton out in a wooded area overnight. Crickets will enter the carton to eat the molasses.**
3. **Be sure to check the trap early in the morning. Once the crickets eat the syrup, they will leave.**





INVESTIGATION #14
Trapping Crickets

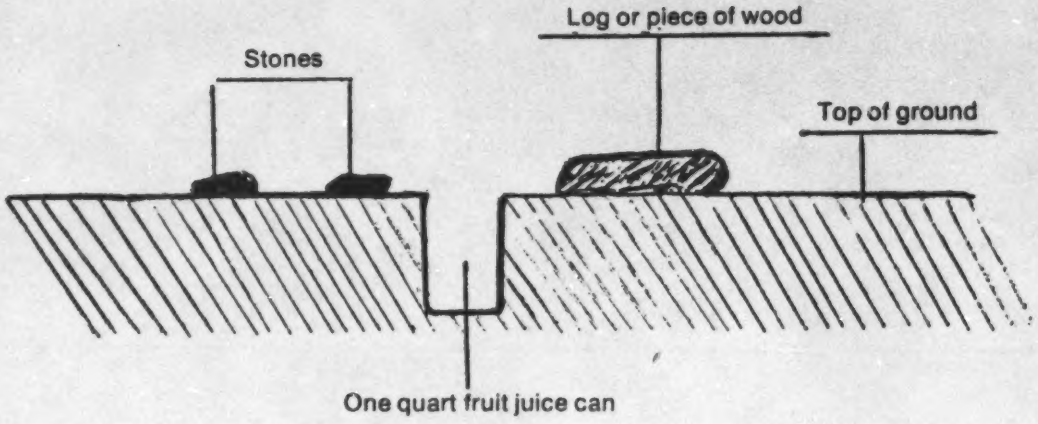
Name _____

WORKSHEET #4-B

The Tin Can Trap

This trap is easy to make. It is probably better than the milk carton type because if a deep can is used, the crickets cannot get out.

1. Bury an empty one quart fruit can with the top removed in the dirt as shown below. It is best to place the can in an area where there is a lot of logs or stones on the ground.
2. Place a slice of bread with dark molasses on it in the bottom of the can.
3. Make sure that the dirt is even with the edge of the can so that the crickets can easily walk over the edge.
4. Check daily. You might find that a number of different insects will be attracted by the molasses.



INVESTIGATION #14
FISHING AND FISHES—Food Chain

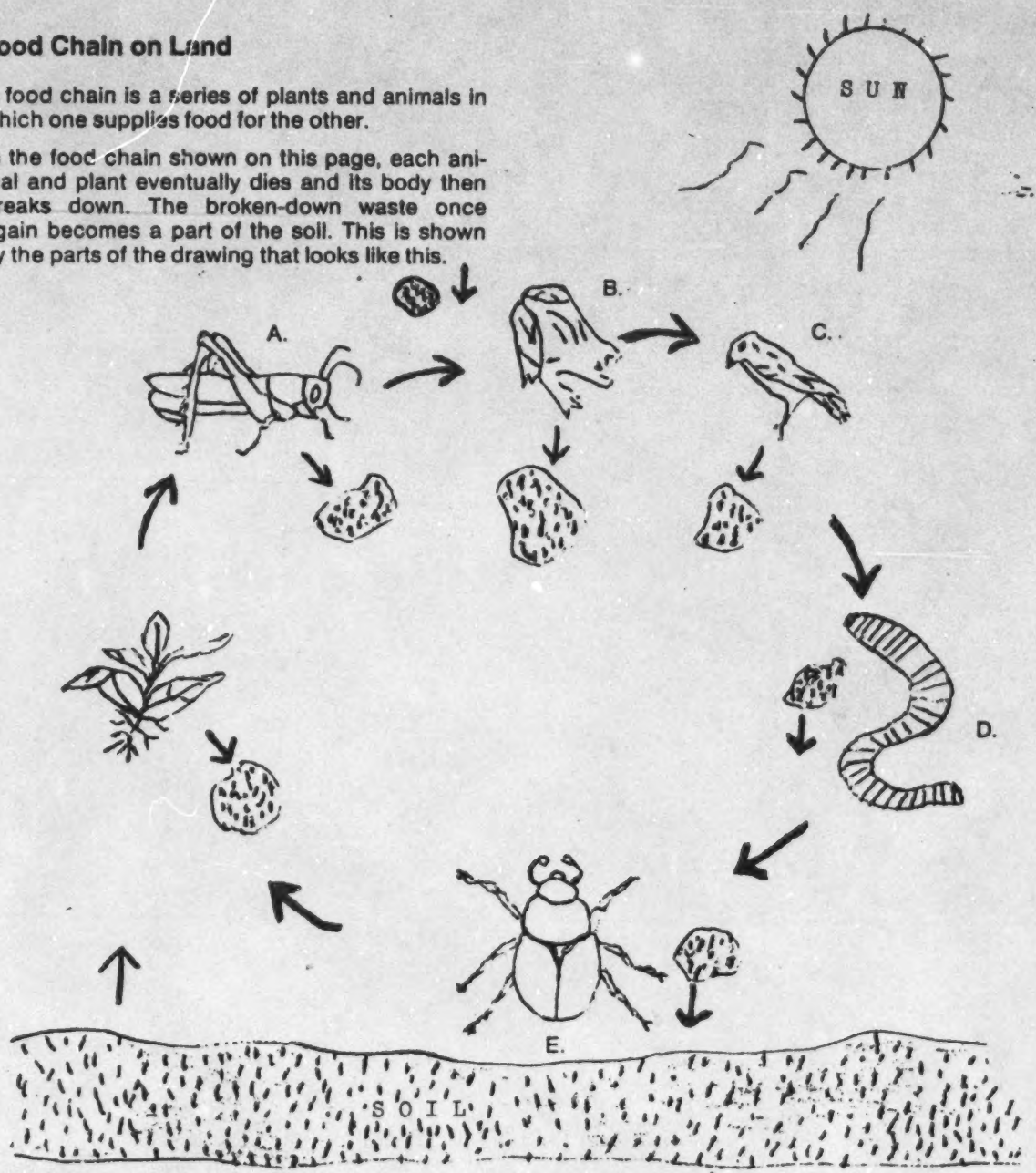
Name _____

WORKSHEET #5-A

Food Chain on Land

A food chain is a series of plants and animals in which one supplies food for the other.

In the food chain shown on this page, each animal and plant eventually dies and its body then breaks down. The broken-down waste once again becomes a part of the soil. This is shown by the parts of the drawing that looks like this.



1. Why is the sun in this drawing? (Discussion)
2. Can you name each animal shown in the food chain?

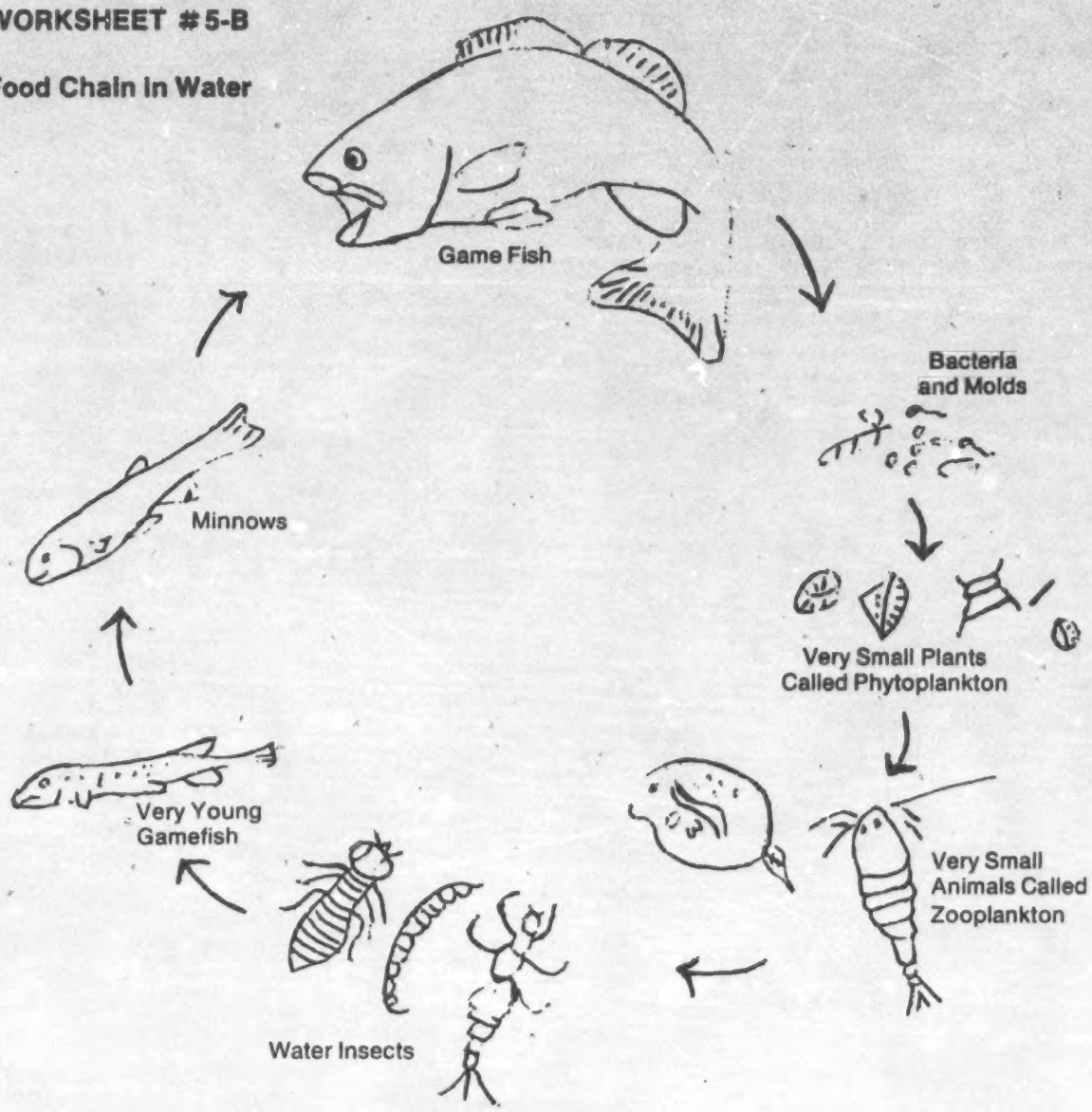
A. _____
B. _____
C. _____
D. _____
E. _____

INVESTIGATION #14
Food Chain

Name _____

WORKSHEET #5-B

Food Chain in Water



When a fish dies, its body decays and bacteria and mold multiply. Very small plants and animals called plankton (you need a microscope to see them) will then live on the bacteria and mold. The plankton is food for water insects and very young gamefish. The minnows and very young gamefish are eaten by larger gamefish. The cycle then starts all over again.

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INVESTIGATION #14
Earthworms

Name _____

WORKSHEET #6

Making an Earthworm Farm

It is easy to start your own earthworm farm, but it is sometimes very difficult to keep them alive.

All you need to get started is a wooden box about twenty inches long, twelve inches wide and six inches deep. The box should not have any holes in it through which the earthworms can escape.

Follow these directions:

1. Place several layers of moist newspaper on the bottom of the box.
2. Cover the newspaper with about two inches of rich, moist soil. Add six to ten earthworms. These should be the small worms you dig up in your garden. Do not use the larger night crawlers that come to the surface of the soil on warm rainy nights.
3. Cover the worms and soil with several layers of moist newspaper. Add two more inches of moist soil and six to ten more worms.
4. Repeat step three one more time and then place several folded layers of moist newspaper on the top of the last layer of soil.
5. Occasionally lift the top layers of paper and sprinkle a tablespoon full of corn meal on the soil. This along with the decaying newspaper will provide food for your earthworms.
6. *Keep the soil moist, but not wet.*
7. Keep the box in a warm and dark place.
8. Make sure that:
   a) The earthworms you use are healthy. If there is any doubt, place them on top of a container filled with soil. The earthworms that do not go down into the soil after several hours should be thrown away.
   b) Never add so much water to the soil and paper that it becomes wet. Earthworms like moist soil because it is needed for them to take in oxygen through their skin. They drown when they are too wet over a long period of time.
   c) Throw out any dead or sickly worms you find in the box when you inspect your farm.
9. Some people raise earthworms. They sell them to stores that sell bait to fishermen. Many earthworm farmers have special secrets that they use when growing their worms. Perhaps you can design a better earthworm farm than this one. If you can, then you will have found a better way. This then can become your secret to managing an earthworm farm.

INVESTIGATION #14
"Going Fishing"

Name _____

WORKSHEET #7

Before we can go fishing, we must prepare our fishing equipment. Your teacher will give you the following:

1. A two section cane pole
2. Ten feet of fishing line
3. One split shot sinker
4. One barbless fishing hook
5. One cork float with a slit cut along one side.

Instructions:

a) Tie the hook at one end of the line. Make sure it will not slip off!

b) Using a pair of pliers, fasten the split shot sinker six inches above the top of the hook.

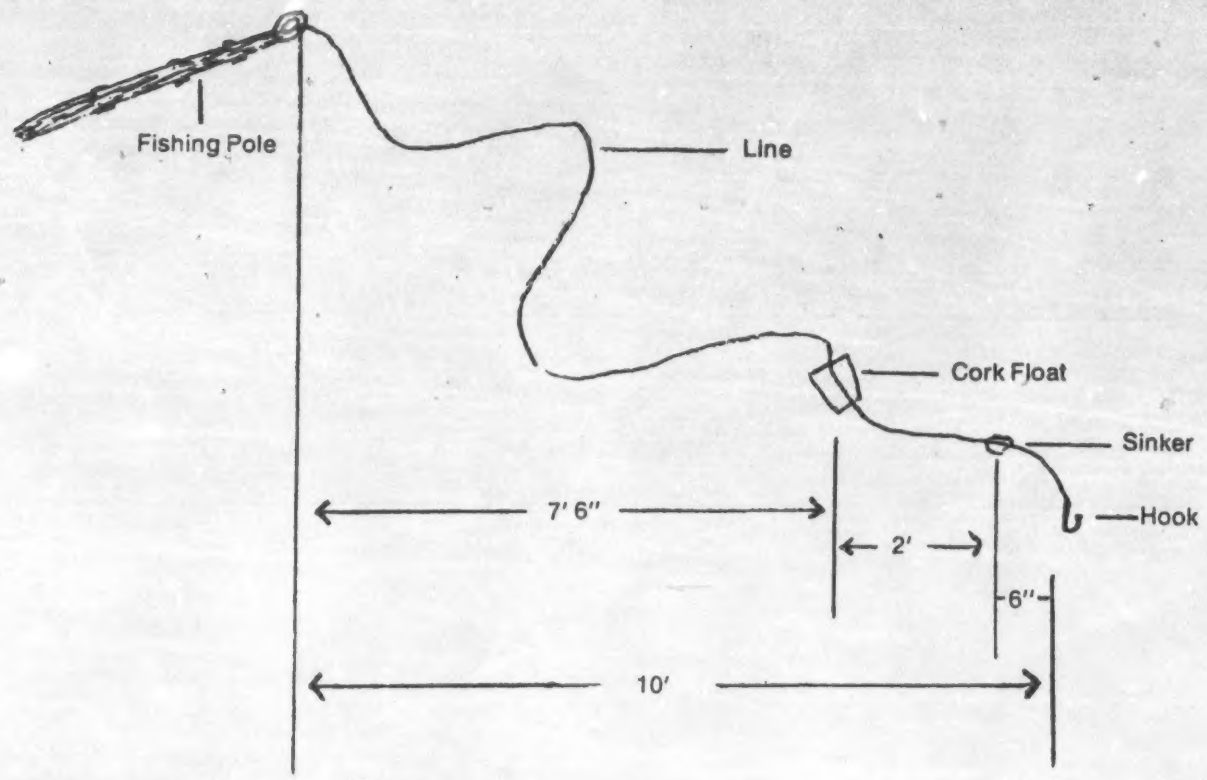
c) Fasten the cork float to the line by running the line into the slit on the side of the cork.

d) Adjust the cork so that the bottom is two feet above the sinker.

e) Tie the free end of the line to the end of the pole.

f) Wrap the line around the end of the pole until the float, sinker and hook are all wrapped together.

g) Place the point of the hook into the cork for protection.



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INVESTIGATION #14
"Going Fishing"

Name _____

WORKSHEET #7

Fishing Instructions:

1. You must have your own supply of bait when fishing. This means that you must collect bait ahead of time.
2. You will fish in pairs of two. There will be one fishing pole for every two persons fishing.
3. *Each person will fish for thirty minutes.*
4. As one person is fishing, his or her partner will complete the following chart. You must measure each fish caught before it is placed back into the pond.
5. Release all fish caught as quickly as possible.

Name of Student Who Caught Fish	Name of Fish Caught	Length of Fish in Inches. (Measure from tip of head to tip of back fin.)

When you get back to the classroom, compare the results. Find out who:

Caught the longest fish
Caught the shortest fish
Caught the most fish.

How many different fish were caught?

What type of fish was caught most often?

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INVESTIGATION #15
SENSES

RATIONALE

Every student should be aware of the importance of his different senses in learning about his environment.

TERMINAL OBJECTIVE

The student will identify and use each of his senses of sight, hearing, touch, taste and smell in the study of his/her environment.

INTRODUCTION

Using *Worksheet #1*, have each student match the senses with the correct body parts.

INSTRUCTIONAL OBJECTIVE #I

Be smelling leaves, twigs and blossoms, the student will become aware of the outdoor smells.

Suggested Activities:

1. Break a sassafras twig in half and let the students smell it.
2. Find some mint and ask the students to describe the smell.
3. Ask the students to sit quietly. After a few minutes, ask them to describe the odors they smell.
4. Point out any shrubs, flowers or trees that are in bloom and ask the students to describe the fragrance.
5. Have students sit among evergreen trees and tell about the fragrance they smell.
6. While on a field trip, have students list the odors they smell and the location of these odors.
7. Discuss why the sense of smell is important to man and other animals.
8. Ask students to unscramble the list of the five senses and their function.

Eye	Feel
Ear	Taste
Nose	Hear
Tongue	Smell
Hands	See

9. In May, look for a black locust tree that is in bloom. Ask the students to describe the odor of the blossoms.
10. Stop along a path and ask the student what they smell. Is it a pleasant smell? Does the ground have an odor? Do leaves smell?
11. While on a field trip in a forest area, sit quietly and wait. Perhaps the students will see a squirrel, chipmunk, or some birds. Do you think these animals smell man or other invaders.

INSTRUCTIONAL OBJECTIVE #II

By tasting selected fruits, berries and grasses, the student will become aware of edible wild foods.

IT IS IMPORTANT THAT STUDENTS REALIZE THAT THEY ARE NOT TO TASTE WILD FRUITS AND GRASSES UNLESS APPROVED BY THE INSTRUCTOR.

Suggested Activities:

1. Have each student chew on some sourgrass. Ask him to describe the taste.
2. In September, let the students taste blackberries. Ask them to describe the taste. (If you do this activity early in September, some blackberries will still be edible.).
3. Have the students taste some mint and have them describe the taste.
4. Let the students taste a berry from the staghorn sumac tree. Ask them to describe the taste.
5. In June, have the students taste wild strawberries. Ask them to describe the taste.
6. Ask the students to bring to school a collection of food items that have a sweet, sour, tart or minty taste.
7. Students will match the taste of items brought from home with those found in nature.
8. In the fall, have students find and pick blackberries, elderberries, everbearing domestic raspberries and wild crabapples. Find a recipe for jelly or jam and provide an opportunity for the students to follow the recipe in making spreads.

INSTRUCTIONAL OBJECTIVE #III

The student will become aware that he can learn to identify events and objects of his/her environment by the sound associated with such events or objects.

Suggested Activities:

1. While on a field trip, have the students sit quietly and listen to their surroundings.
2. Pass out *Worksheet* and ask the students to put an "X" by each sound they hear.
3. Permit students to discuss the sounds that they heard.

INSTRUCTIONAL OBJECTIVE #IV

By touching leaves, stems, and bark of trees, the student will experience and describe the meaning of rough, smooth, fuzzy, prickly and thorny.

Suggested Activities:

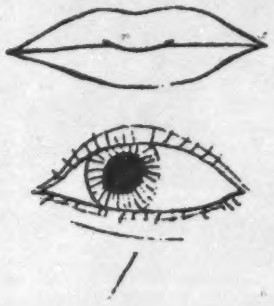
1. While on a field trip, have the students feel the leaf of the American Elm tree. Ask them to describe its texture.
2. Have each student feel a sassafras leaf and describe the texture.
3. Have each student feel a raspberry or blackberry stem and describe how it feels.
4. Have each student feel the stem of a staghorn sumac tree. Why is the tree called a staghorn sumac?
5. Have each student feel the stem of a sweet gum tree. Describe how it feels.
6. Blindfold each student and let them feel the bark of a shagbark hickory, a beech, a birch, and an elm tree. Ask the students to describe the texture of the bark of each tree. Take the blindfold off and ask each student to add to his/her description.
7. With a sheet of newsprint and pencil, make a rubbing of different barks of trees to take back to the room for sharing.
8. Let the student feel the edges of the following leaves: oak, American linden, beech, and tulip poplar. Ask each student to describe if the edge of each leaf was; rough, smooth, jagged or saw-toothed.
9. Upon returning from a trip, have students list things with which they came into contact that are smooth, fuzzy, prickly, or thorny.

INVESTIGATION #15
SENSES

Name_____

WORKSHEET #1

Instructions: Draw a line from the body part to the correct sense.



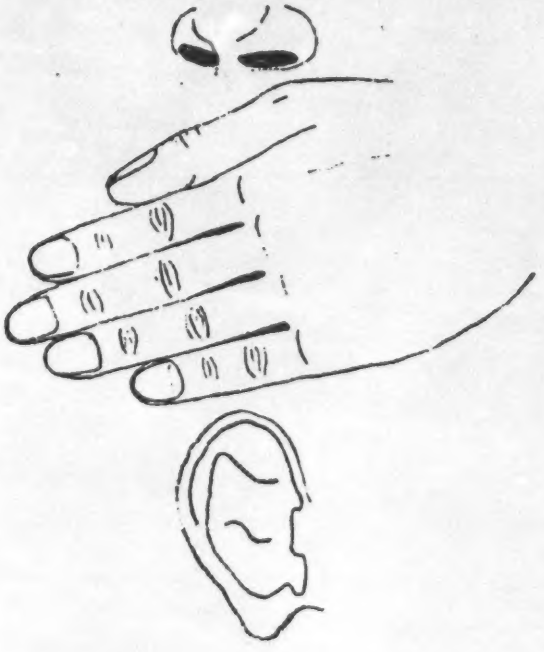
TOUCH

TASTE

SMELL

SEE

HEAR



INVESTIGATION #15
SENSES

Name _____

WORKSHEET #2

Instructions:
Place an "X" in the ☐ next to the drawing when you hear a sound made by that animal or object.

☐

☐

☐

☐

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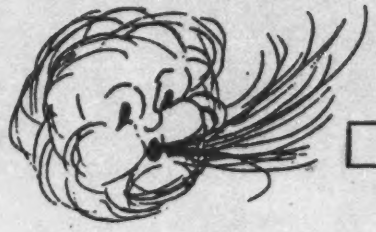
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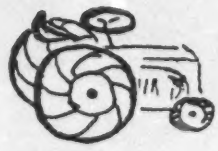
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